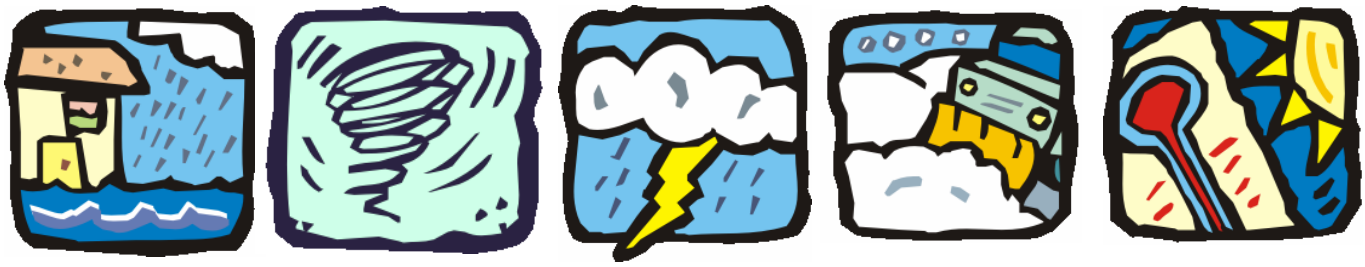

Natural Hazards Mitigation Plan

Eau Claire, Wisconsin

City of Eau Claire

West Central Wisconsin
Regional Planning Commission

CITY OF EAU CLAIRE
NATURAL HAZARDS MITIGATION PLAN

PREPARED BY:

Natural Hazards Mitigation Plan Steering Committee

WITH ASSISTANCE BY:

West Central Wisconsin Regional Planning Commission

Approved March 9, 2004 by Eau Claire City Council

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SECTION I.

INTRODUCTION

A. PURPOSE OF THE PLAN

The City of Eau Claire Natural Hazards Mitigation Plan has been prepared as a result of the City's application for, and award of, Federal *Project Impact* program grant funds. These funds are dispersed by the Federal Emergency Management Agency (FEMA) through Wisconsin Emergency Management (WEM). The purpose of *Project Impact* is to provide assistance to communities for activities that will reduce the risk of natural disasters on community's residents and property.

The primary focus of the plan is to evaluate the community's potential exposure to natural disasters and identify appropriate mitigation strategies. Consistent with the Code of Federal Regulations, the City decided to limit the scope of this planning effort to natural hazards only at this time, though this plan conforms to Federal all hazards mitigation planning requirements.

> The Code of Federal Regulations states...
>
> "The local mitigation plan is the representation of the jurisdiction's commitment to reduce risks from natural hazards, serving as a guide for decision makers as they commit resources to reducing the effects of natural hazards."
>
> (44 CFR Part 201.6, pp 8851)

Development of the plan will help the City identify areas of risk, assess the magnitude of the risk, and develop strategies for reducing the risk. Through this process, the city can address issues related to incompatible land uses, the protection of critical services and historic properties, and the reduction of community and taxpayer costs associated with natural disaster relief and rescue efforts. Completion and approval of the plan will also make the City of Eau Claire eligible to apply for future disaster relief and mitigation project funds, enabling the city to implement some of the recommended mitigation strategies.

B. PLANNING PROCESS

On May 14, 2002, the City Council of the City of Eau Claire adopted a Flood Mitigation Plan. In an effort to further the goals and objectives of said plan, and to proactively identify strategies to mitigate the risks and vulnerabilities associated with other natural hazards, the City developed this Natural Hazards Mitigation Plan. Completion of the plan would enable the City to evaluate the City's past mitigation activities, identify current risks, and provide guidance towards future mitigation efforts.

Development of the City of Eau Claire Natural Hazards Mitigation Plan was based on the planning requirements and guidance provided by the Federal Emergency Management Agency[1] and the Wisconsin Department of Military Affairs, Wisconsin Emergency Management[2]. As

[1] Federal Emergency Management Agency, Hazard Mitigation Planning and Hazard Mitigation Grant Program, 44 CFR Parts 201 and 206 (Washington: Government Printing Office, February 26, 2002) 8844-8854.
[2] Wisconsin Emergency Management. Resource Guide to All Hazards Mitigation Planning in Wisconsin. April 2003.

such, the plan meets the requirements of the Disaster Mitigation Act of 2000. The plan scope is limited to the City of Eau Claire and is not considered a multi-jurisdictional plan.

To complete the development of the plan, the City of Eau Claire contracted with the West Central Wisconsin Regional Planning Commission. In addition, the City established the Natural Hazards Mitigation Plan Committee, shown in **Table 1** below. Committee members were selected from those City departments involved in emergency management issues, in addition to a representative from Eau Claire County Emergency Management. Since Eau Claire is a relatively smaller city, Committee members are very knowledgeable of the issues and concerns of the City's residents. The Committee was responsible for providing input, helping guide the planning process, and reviewing the draft plan.

TABLE 1. CITY OF EAU CLAIRE NATURAL HAZARDS MITIGATION PLAN STEERING COMMITTEE

Name	Representative of:
Lyle Koerner	Deputy Chief - Operations, Eau Claire Fire Department
Bruce Fuerbringer	Fire Chief, Eau Claire Fire Department
Rebecca Noland	Director, Finance Department
Brian Amundson	Director, Public Works Department
John Genskow	City Engineer, Engineering Division, Public Works Department
Jerry Matyzik	Police Chief, Eau Claire Police Department
Mike Green	Administrator, Inspection Services Division
Tom Reiter	Assistant Planner, Eau Claire Planning Division
Dale Peters	Director, Human Resources & Risk Management Departments
Hal Swanstrom	Coordinator, Eau Claire County Emergency Management

Development of the plan began in January 2003 and was completed with the City Council's adopting resolution passed on March 9, 2004. The process commenced with an introductory Steering Committee meeting following the Wisconsin Emergency Management-sponsored workshop in late 2002 on all hazards mitigation planning. Once the planning process was initiated, the general stages of plan development included: (1) initial data collection and development of the community profile, (2) identification and prioritization of hazard risks by the Steering Committee, (3) community vulnerability and risk assessment, (4) development of the mitigation plan (goals, objectives, strategies, and action plan) and (5) development of the plan maintenance and coordination strategy. This process is further summarized in **Figure 1** at the end of this section.

The City of Eau Claire adopted a Flood Mitigation Plan in May 2002, which had received the approval of Wisconsin Emergency Management and the Federal Emergency Management Agency. Rather than duplicating this effort, the Flood Mitigation Plan was incorporated as a special addendum to this Natural Hazards Mitigation Plan and is referenced herein.

The mapping work as part of the community profile (**Section II**) and assessment of hazard conditions (**Section III**) was performed using the ArcView Geographic Information System, allowing greater manipulation and analysis from the use of a consistent base map. The FEMA HAZUS tool was not utilized due to the availability of current local data and numerous divergences between census tracts and the City's corporate boundaries. Maps included in this

plan are for general planning purposes only and do not constitute legal documents or formal surveys.

During the assessment of hazard conditions (**Section III**), the Steering Committee and other City Department heads and staff completed a risk assessment worksheet for the many potential natural hazards facing the City. Based on the results of this worksheet, in concert with National Weather Service historical data, the Steering Committee prioritized and selected the natural hazards to be the focus of this plan—flooding, tornadoes, thunderstorms, winter storms, and extreme temperatures.

A series of key stakeholder interviews were performed by West Central Wisconsin Regional Planning Commission (WCWRPC) staff with each Steering Committee member and other stakeholders. These interviews included discussions with emergency management personnel from the adjacent jurisdictions of Eau Claire County, Chippewa County, and City of Altoona. Key stakeholders from the community, such as representatives from the school district, university, utilities, and Hmong Association, were also interviewed. The complete list of these interviews are included in **Appendix B**. With the guidance provided by these interviews and previous planning steps, the Steering Committee approved the mitigation goals, considered alternatives strategies, and developed the action plan, as well as identified opportunities for plan coordination and a strategy for plan maintenance.

In addition to the Steering Committee meetings, the City also provided opportunities for public input, review, and comment on the plan. These activities included:

- **Public Information and Plan Review Meeting**. On November 5, 2003, a public informational and draft plan review meeting was held to allow the public the opportunity to review and comment on the proposed plan. Advertisement of the informational meeting included a press release to local newspapers, radio, and television stations and a meeting notice filed with the City Clerk. A copy of this public notice and related materials are included in **Appendix C**. The meeting notice and draft plan strategies were also directly mailed to key stakeholders within the City, neighboring jurisdictions, the 20 city neighborhood associations, and the regional office of Wisconsin Emergency Management Public. Input received was supportive of the planning effort and, overall, consistent with the plan strategies. Based on public feedback, the plan was amended to include discussion on mitigation activities for unanticipated releases of hazardous materials due to catastrophic weather events (Section III-C (ii)) and for strategy #32 regarding the proposal to establish a fire sprinkler ordinance for commercial facilities.

- **Plan Commission Review and Recommendation**.
  On March 1, 2004, following conditional approval of the plan by FEMA, the Plan Commission held a public meeting to consider the Natural Hazards Mitigation Plan and provide a positive advisory recommendation to the City Council. Advertisement of the meeting was completed using the standard Plan Commission meeting notice procedure. A copy of the meeting minutes are included in **Appendix D**.

- **City Council Meeting**.
  On March 8, 2004, the City Council held a public discussion on the proposed plan. On March 9, 2004, the City Council considered and adopted the Natural Hazards Mitigation Plan

at a duly called and noticed public meeting. A copy of the adopting resolution and related meeting agendas and minutes are included in **Appendix A**.

Figure 1. Eau Claire Natural Hazards Mitigation Planning Process Diagram

Plan Initiation
scope: contracting, consensus on process, organize steering committee
City roles: mandate to proceed, establish steering committee
RPC roles: facilitate process
Cmte roles: initial introductory meeting on all hazards mitigation planning

Community Profiling
scope: data-collection phase (inventory, stats, uses, trends)
local roles: assist w/ data collection, including existing plans
RPC roles: data collection, analysis, & compilation
Cmte roles: review findings
other issues: identification of critical facilities

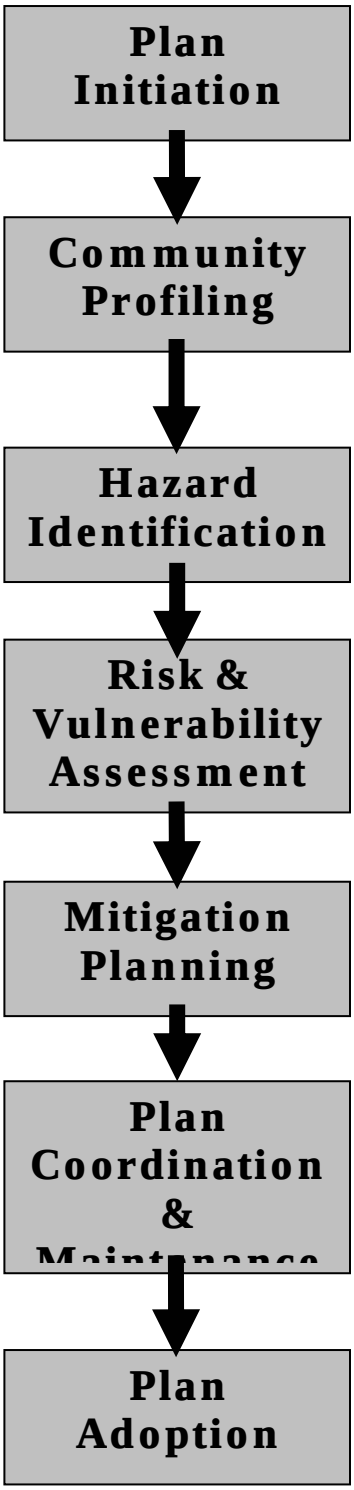
Hazard Identification
scope: identify key hazards
local roles: assist w/ data collection (historical records on events)
RPC roles: data collection (w/ NOAA data) & facilitation
Cmte roles: identify & prioritize key hazards (survey matrix)

Risk & Vulnerability Assessment
scope: identify risks (full history & trends), and vulnerabilities
local roles: identify current mitigation activities
RPC roles: data collection, analysis, & facilitation
Cmte roles: review findings & additional input
other issues: integrate information from Flood Mitigation Plan

Mitigation Planning
scope: goals, objectives, strategies, & action plan
local roles: coordinate meetings & guidance on strategies
RPC roles: facilitation, analysis & guidance on strategies
Cmte roles: goal-setting, propose & review strategies
other issues: cost-benefits analysis of strategies; Flood Mitigation Plan

Plan Coordination & Maintenance
scope: relationship to other plans & future plan review/updates
local roles: help identify links to other plans; vision for reviews
RPC roles: facilitation & suggestions
Cmte roles: review & modify/amend recommendations
other issues: integrate required 5-year updates

Plan Adoption
scope: public meetings, FEMA pre-review, adoption
local roles: facilitate public meetings, notifications, comments, adopt
RPC roles: assist w/ public meeting & modifications to plan
Cmte roles: consider public input & approve draft policy changes
other issues: special mailings; media



SECTION II.

COMMUNITY PROFILE – CITY OF EAU CLAIRE

The community profile section of the plan is intended to provide background data and analysis in order to better understand the natural and man-made characteristics of the community. Included in this section is a description of the natural and demographic characteristics, general development trends, and an inventory of critical facilities.

A. GEOGRAPHIC LOCATION

The City of Eau Claire, shown in **Figure 2**, is located in west-central Wisconsin. The corporate limits of the city extend over parts of two counties (Eau Claire and Chippewa) and include over 32 square miles of land area.

Eau Claire (French for "Clear Water") is located at the confluence of the Eau Claire and Chippewa Rivers and began as a lumbering settlement during the 1840s. At that time, the Eau Claire area was one of the largest stands of white pine in North America. After the depletion of timber resources, dairy farming became the main economic activity in the county. The city grew to become the major center for health and professional services, education, retail trade and industry in the western Wisconsin region. Today the population of Eau Claire is nearly 62,000 and it continues to prosper as the major trade center. The city is surrounded by fertile agricultural land, remnants of large pine forests, and scenic lakes and rivers. To this day, Eau Claire remains as the county seat of Eau Claire County.

B. NATURAL FEATURES AND ENVIRONMENT

As stated earlier, Eau Claire is located at the confluence of the Chippewa and Eau Claire Rivers. The city is bounded by wooded hills on the northeast, south and southwest. The land surrounding the community is primarily devoted to agriculture, open fields, woodlands, wetlands and lakes. These natural features offer many outdoor recreation opportunities and provide a very scenic and attractive setting for residents.

i. Watersheds

A watershed is an area of land that drains or "sheds" its water to a lake, river, stream or wetland. Some watersheds encompass several hundred square miles, while others may be small, covering only a few square miles that drain into a lake. This is important to understand since the effects of natural and man-made activities in one area can have a direct impact on other areas. For example, run-off from a heavy rainfall upstream in a watershed will eventually reach the down stream part of the watershed. Shown in **Figure 3** are the watersheds that are wholly or partially located within Eau Claire and Chippewa counties.

FIGURE 2. General Geographic Location
CITY OF EAU CLAIRE

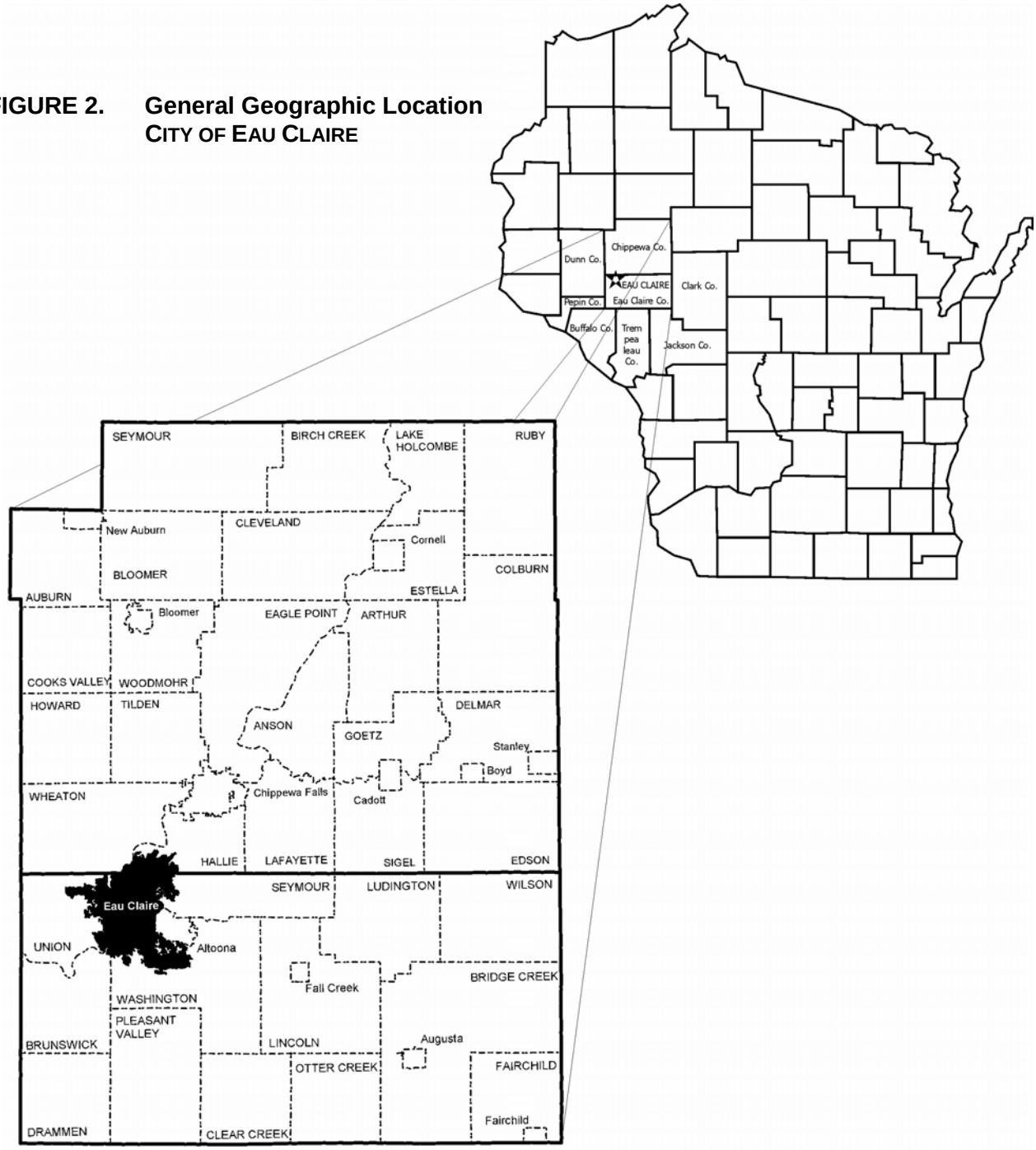
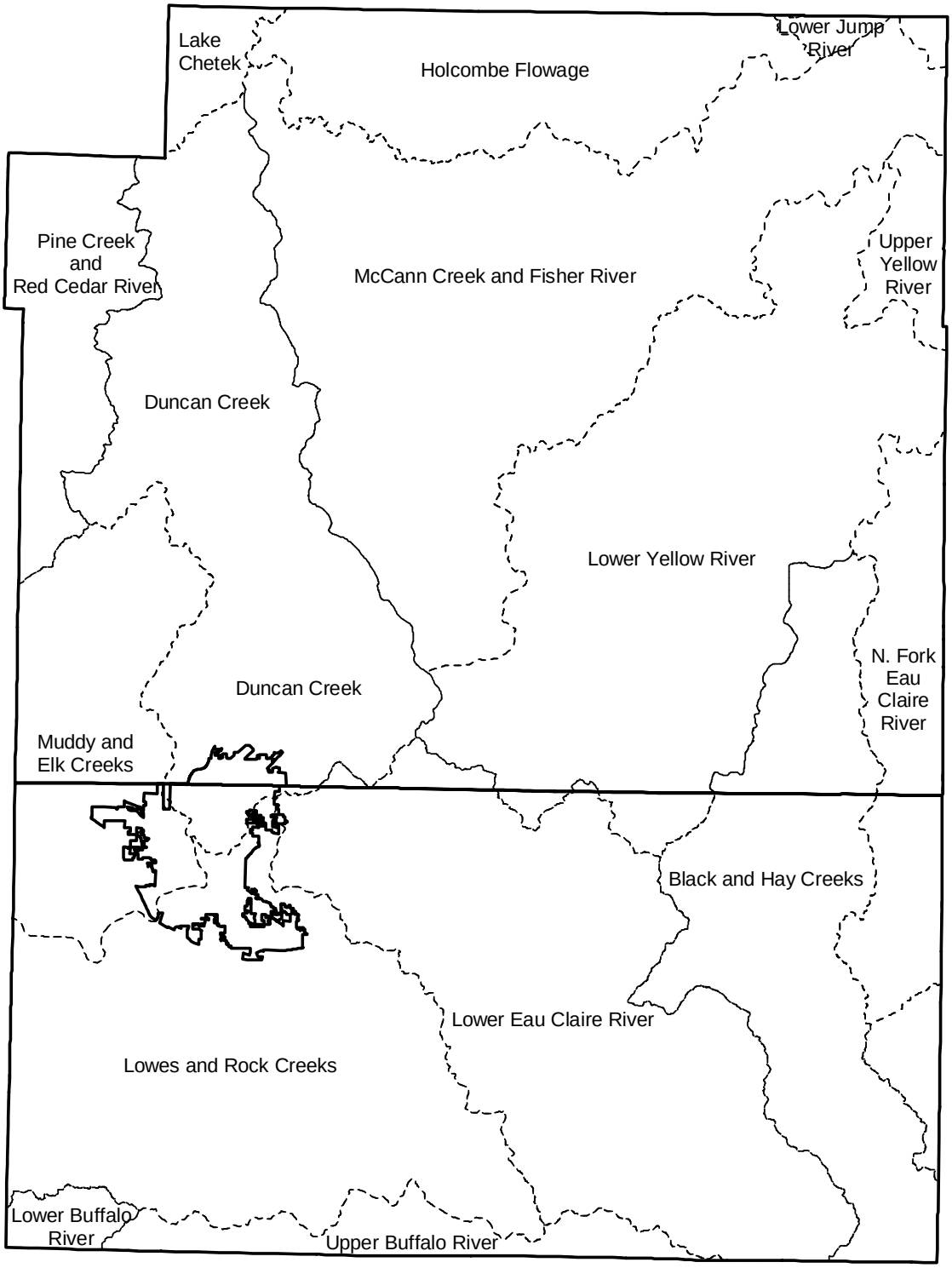


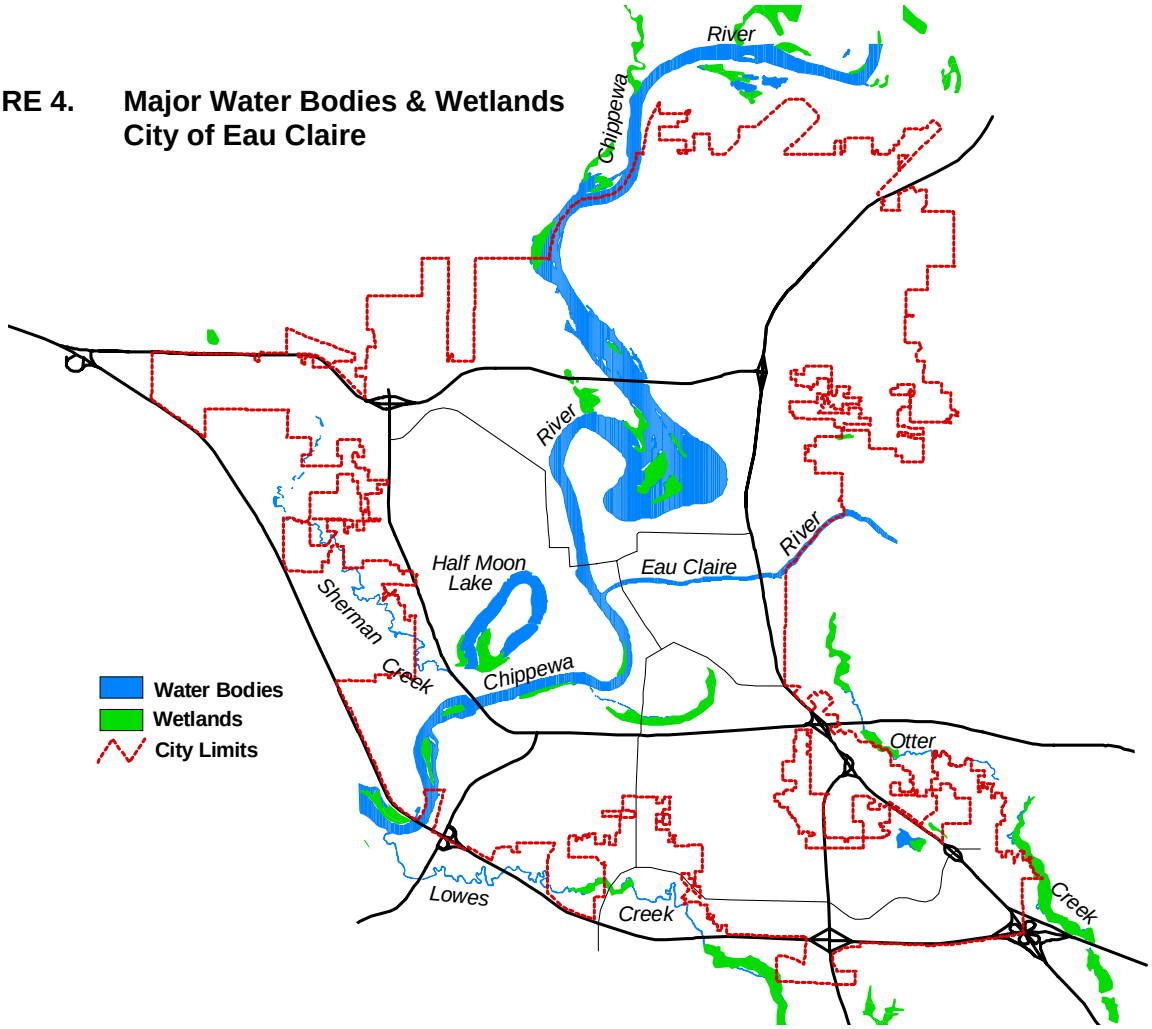
FIGURE 3. Watersheds
City of Eau Claire and Eau Claire and Chippewa Counties



ii. Lakes, Rivers and Streams

The main water bodies located within the city are the Chippewa and Eau Claire Rivers. The Chippewa River flows from north-central Eau Claire, through the central part of the city, to the southwest. The Eau Claire River enters the city from the east and flows west into the Chippewa River in central Eau Claire. Other significant water bodies include Half Moon Lake, and Lowes, Otter and Sherman Creeks. These bodies of water are shown in **Figure 4**.

FIGURE 4. Major Water Bodies & Wetlands City of Eau Claire



The floodplain and flood hazard areas within the City associated with these water bodies are discussed later within **Section III. Assessment of Hazard Conditions** of this report, and are detailed within the *City of Eau Claire Flood Mitigation Plan* (see Special Addendum) adopted May 2002. Development in the City's floodplain and "floodplain islands" are locally regulated as an overlay district in the *City of Eau Claire Zoning Ordinance* (overlay district is included as part of Special Addendum).

iii. Wetlands

There are a number of wetland areas within the watersheds that can affect water levels of rivers and creeks flowing through Eau Claire. Wetlands are defined by the State Statute as "an area where water is at, near, or above the land surface long enough to be capable of supporting aquatic or hydrophytic (water-loving) vegetation and which has soils indicative of wet

conditions." Wetlands may be seasonal or permanent and are commonly referred to as swamps, marshes, or bogs. Wetland plants and soils have the capacity to store and filter pollutants, replenish groundwater supplies, store floodwaters and maintain stream flows. The wetland areas within the City of Eau Claire are delineated on **Figure 4** of the previous page.

iv. General Climate and Other Natural Hazards

The climate of Eau Claire is classified as mid-latitude continental. Warm, humid summers and cold, snowy winters are the main characteristics. The average monthly temperature ranges from 15 degrees Fahrenheit in January to 73 degrees Fahrenheit in July. Annual precipitation averages 32 inches, with approximately two-thirds of this occurring as rain. Seasonal snowfall ranges from 12 to 75 inches.

In addition to flooding, the City of Eau Claire is susceptible to other natural hazards. Since these natural hazards can occur in various locations within the city, a separate map was not prepared concerning these natural hazards. The other natural hazards prioritized by the Steering Committee include thunderstorms, tornadoes, winter storms, and extreme temperatures. Descriptions of each of these natural hazards, along with historical trends and current risks, are included in **Section III** of this report.

C. DEMOGRAPHIC AND ECONOMIC PROFILE

i. Population

According to the 2000 Census, the population of Eau Claire was 61,704. This was a 4,848 person, or 8.5% increase, from 1990. Although this rate of increase was lower than the previous three decennial periods from 1980 to 1990 (10.4%), 1970 to 1980 (15.4%), or 1960 to 1970 (17.5%), the city continues to grow at a significant rate as shown in **Table 2**.

TABLE 2. Historic Population • 1960 to 2000
City of Eau Claire

Year	Population	Numerical Change	Percent Change
1960	37,987		
1970	44,619	6,632	17.5%
1980	51,509	6,890	15.4%
1990	56,856	5,347	10.4%
2000	61,704	4,848	8.5%

Source: 1960, 1970, 1980, 1990, & 2000 Census

In fact, preliminary population projections prepared by the West Central Wisconsin Regional Planning Commission, using population change during the decennial periods from 1970 through 2000 indicate a continuing trend in growth, shown in **Table 3**. For the 20-year period from 2000 to 2020, the City of Eau Claire is projected to increase by 13,034 people. This is an overall increase of 21.1%, or an average of nearly 1.1% annually.

TABLE 3. Population Projections • 2000 to 2020
City of Eau Claire

	2000	2005	2010	2015	2020
	Census	*Projection*	*Projection*	*Projection*	*Projection*
Population	61,704	64,311	66,918	69,524	74,738

Source: 2000 Census; West Central Wisconsin Regional Planning Commission, October 2001

When compared to Wisconsin as a whole, the demographics of the City of Eau Claire are impacted, in part, by the University of Wisconsin-Eau Claire[3]. Eau Claire's population is slightly younger than State averages, especially in the 15-24 year age cohorts (26% for the City vs. 14.3% for the State). The result is a higher percentage of renter-occupied housing units within the City (42.7%), smaller average household sizes (2.38), and a higher percentage of the population residing in group quarters, such as dormitories (6.1%).

Though the City of Eau Claire is less racially diverse than Wisconsin as a whole, the Eau Claire MSA is also home to approximately 2,000 Hmong people, a unique characteristic which places the City within the Top 20 metropolitan areas in the United States by Hmong population.[4] Language barriers, especially among older Hmong, could potentially contribute to a lack of knowledge of hazard mitigation issues and actions (e.g., purpose of siren warning systems).

ii. Housing

Continued population growth in the City of Eau Claire has created a corresponding demand for additional housing, shown in **Table 4**. From 1990 to 2000, the number of housing units increased by 3,015, from 21,316 to 24,895. This is an increase of 14.1% over 10 years, or an average of 1.4% annually.

TABLE 4. Housing Unit Change • 1960 to 2000
City of Eau Claire

Year	Number of Housing Units	Numerical Change	Percent Change
1960	12,221		
1970	14,274	2,053	16.8%
1980	18,359	4,085	28.6%
1990	21,316	2,957	16.1%
2000	24,895	3,015	14.1%

Source: 1960, 1970, 1980, 1990, & 2000 Census

Using a simple housing unit projection methodology, it is possible to estimate of the number of additional housing units that will be required to meet the projected population change. The methodology for developing housing projections relies on the projected population change and an estimate of the average number of persons per housing unit. Based on the most recent census

[3] demographic information from: U.S. Census Bureau. "Table DP-1. Profile of General Demographic Characteristics for Wisconsin: 2000". Census 2000.
[4] Mark E. Pfeifer, PhD., compiler. "Top 50 Municipalities by Hmong Population." Hmong Studies Internet Resource Center. source data from: US Census 2000. <http://www.hmongstudies.org/top50metarby.html>.

population (61,704) and the total number of the housing units that same year (24,895), an average of 2.48 persons per housing unit can be calculated. The housing occupancy figure is then applied to the population projections to determine the anticipated need for additional housing during the planning period. Shown in **Table 5**, are the housing unit projections for the City of Eau Claire for the years 2000 through 2020.

TABLE 5. Housing Unit Forecast • 2000 to 2020
City of Eau Claire

	2000 *Census*	2005 *Projection*	2010 *Projection*	2015 *Projection*	2020 *Projection*
Population	61,704	64,311	66,918	69,524	74,738
Housing Units	24,895	25,932	26,983	28,034	30,136
Housing Unit Change	*current*	1,037	1,051	1,051	2,103

Source: 2000 Census; West Central Wisconsin Regional Planning Commission, October 2001

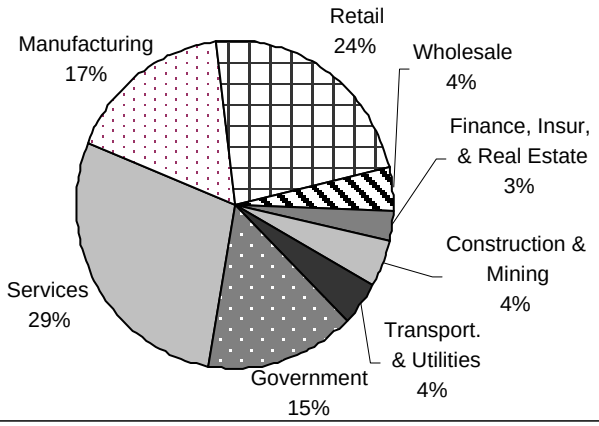
As of 2001, a total of 139 properties had mobile homes, though there has been no additional mobile home park development in the past 15 years. Due to this very low demand for such house, no vacant lands are currently zoned for mobile home park development and additional development of this type is not anticipated.

iii. Economic Overview

The City of Eau Claire, located just 80 miles east of Minneapolis/St. Paul, is West Central Wisconsin's regional center for shopping, cultural events, health and professional services, education, industry, and technology.

The employment-by-industry sector graph to the right (**Figure 5**) demonstrates Eau Claire's diverse economic base and role as a regional center.

Figure 5. 2000 Non-Farm Employment Average Chart
(Eau Claire MSA)



Referred to by former Governor Tommy Thompson as the "Silicon Valley of the Midwest," the Eau Claire area is home to a large cluster of high-tech companies including 3M, Honeywell, Phillips Plastics, Silicon Logic Engineering, Rockwell Automation/Allen Bradley, and Cray, Inc.

When Uniroyal Goodrich Tire Company, Eau Claire's largest employer, closed it's doors in 1992, the community bounced back economically by diversifying the business base and bringing in new employers. Some of those companies include Hutchinson Technology Inc., W.L. Gore & Associates, and Pleasant Company.

Today Eau Claire has a vibrant and expanding business base and continues to celebrate with success stories such as United Health Group, Nestle, Intek Plastics, EBY-Brown Company, and numerous expansions by existing businesses. Other major employers within the City include the

Eau Claire Area School District, Luther Hospital-Mayo Health System (hospital), Menard Inc. (home improvement retail and distribution, Sacred Heart Hospital, and the University of Wisconsin-Eau Claire.

As of January 1, 2000, the median household income in the City of Eau Claire was $32,118 after taxes, approximately $5,000 less than the State of Wisconsin average; 28.5% of the City's households had an annual income less than $20,000.[5] As of May 2003, the unemployment rate within the City of Eau Claire was 4.6% (representing approximately 4,000 persons), and below the State of Wisconsin rate of 5.4%.[6]

iv. Property Value

According to the Wisconsin Department of Revenue,[7] the aggregated equalized assessed value for the City of Eau Claire was almost $3 billion. **Table 6** at the right summarizes the 2002 Statement of Assessments for the City.

TABLE 6. City of Eau Claire 2002 Assessed Total Values[6]
(*equalized*)

Land	$ 591,258,900
Improvements	$2,256,829,400
Real Estate	$2,848,088,300
Personal Prty	$ 130,737,700
Aggregate	$2,978,826,000

From 2001 to 2002, the City's assessed value grew by 8%, with the value of all land growing by 23% during this timeframe, slightly above the 7% average annual growth experienced over the past five years. **Table 7** further breaks down the 2002 assessed values by primary land uses:

TABLE 7. Assessed Value by Land Use • 2002 City of Eau Claire

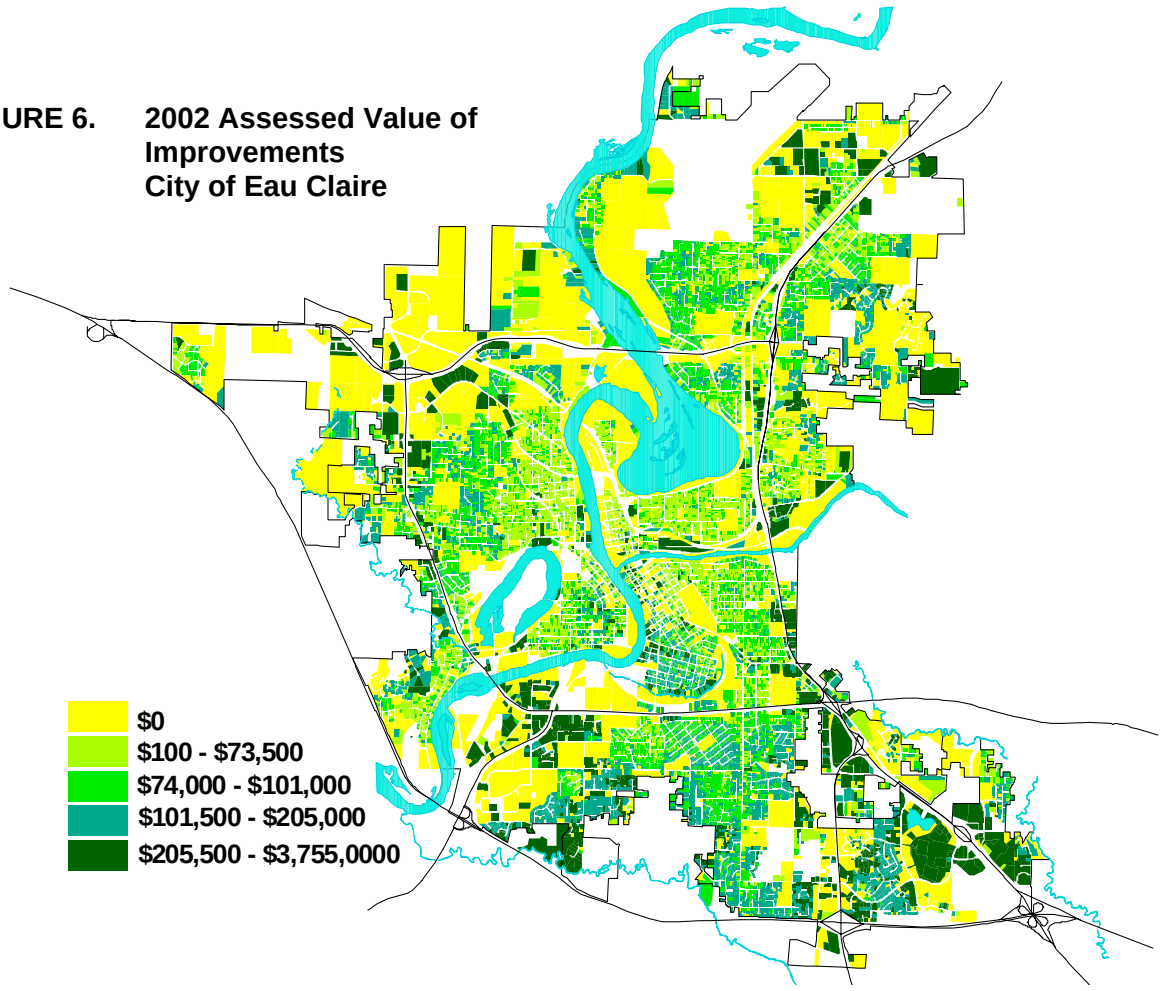
	# of properties	Land Value	Improvements	Total
Residential	19,087	$357,881,850	$1,525,899,600	$1,883,781,450
Commercial	2,669	$235,867,000	$667,559,900	$903,426,900
Manufacturing	108	$14,806,100	$111,002,900	$125,809,000
Totals	21,864	$608,554,950	$2,304,462,400	$2,913,017,350

source: City of Eau Claire Assessments Department. Final Statement of Assessment – Year 2002.

In addition, a total of $135 million in personal property was assessed in 2002. **Figure 6** on the following page shows the 2001 distribution of assessed value of the improvements within the City, excluding public properties.

[5] Eau Claire Area Industrial Development Corporation, compiler. Eau Claire Wisconsin Economic Profile. April 2001. source data from: Sales & Marketing Management, 2000 Survey of Buying Power.
[6] U.S. Department of Labor, Bureau of Labor Statistics
[7] Wisconsin Department of Revenue, Bureau of Equalization. 2002 Statement of Changes in Equalized Values by Class and Item.

FIGURE 6. 2002 Assessed Value of Improvements City of Eau Claire



Source: City of Eau Claire Property Assessment Database, 2002

D. GENERAL DEVELOPMENT PATTERN

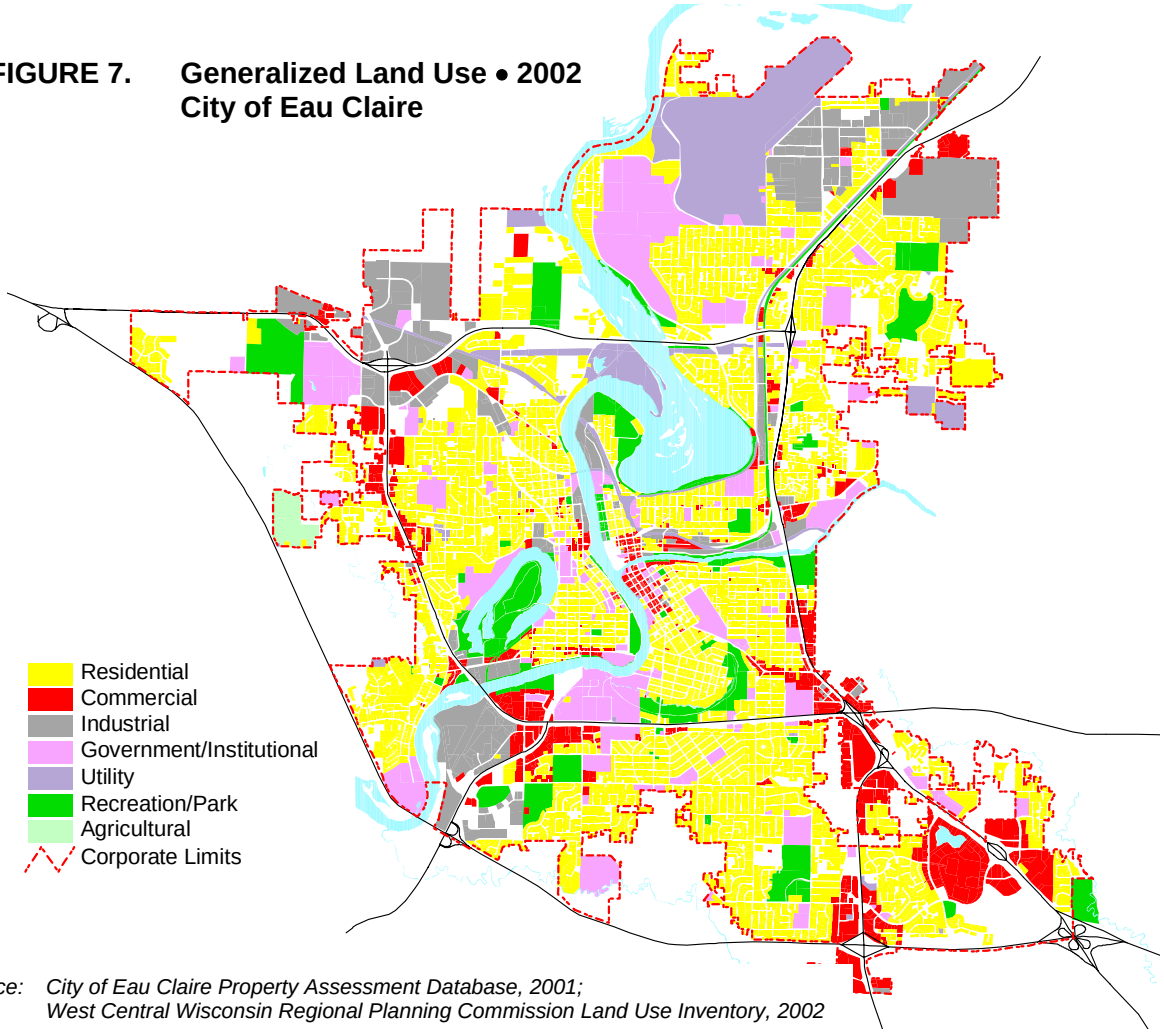
The City's current land use pattern is historically linked to the use of the region's rivers and streams for transportation during its initial settlement. The City of Eau Claire began to develop around the logging industry during the 1800s. As a result, like many communities established during this period, the city is centered on the confluence of the Chippewa and Eau Claire Rivers.

As stated earlier in the plan, Eau Claire is a major trade center in western Wisconsin. In addition to supporting residents, businesses and industry within the city, it also provides many services and support to surrounding communities. Thus, the city has continued to prosper and grow throughout its existence.

Currently, the predominant land use within the city is residential, with major concentrations of commercial land uses located in the central, northwestern, southwestern, and southeastern areas of the city. There are also major industrial land uses located in the northwestern, northeastern and southwestern parts of the city. These general land uses are shown in **Figure 7** on the following page.

Between 1990 and 2000, a total of 2.43 square miles (or 1,555 acres) were annexed into the City of Eau Claire, and a total of 60 new subdivision permits approved. Annual construction permits increased during this time to a total of 493 residential and 181 non-residential permits granted during 2000. The majority of this new residential construction is occurring on the City's south and west sides, and includes both single-family and multi-family homes.[8]

FIGURE 7. Generalized Land Use • 2002 City of Eau Claire



Source: City of Eau Claire Property Assessment Database, 2001; West Central Wisconsin Regional Planning Commission Land Use Inventory, 2002

Assuming that the present growth trends continue, the City of Eau Claire (urbanization) is expected to continue its expansion into the surrounding towns. This development will continue to put pressure on the shores of lakes, rivers and streams, and their associated floodplains. However, there are no known unique hazard risks related to planned growth areas.

[8] Eau Claire Department of Community Development. City of Eau Claire 2000 Development Map and Report.

E. CRITICAL FACILITIES

A critical facility is defined as a facility in either the public or private sector that provides essential products or services to the general public, is otherwise necessary to preserve the welfare and quality of life in the City of Eau Claire, or fulfills important public safety, emergency response and/or disaster recovery functions.

During the development of the *2002 City of Eau Claire Flood Mitigation Plan* (see Special Addendum*)*, city staff worked with various City departments and Eau Claire County Emergency Government to identify the following types of critical facilities:

- government buildings and facilities
- law enforcement and emergency response facilities
- elderly homes (e.g., assisted living, CBRF, nursing care)
- schools and colleges
- hospitals

Utilizing the ArcInfo/View geographical information system, West Central Wisconsin Regional Planning Commission staff compiled **Figure 8** on the following page which identifies the locations of the critical facilities within the City of Eau Claire listed above. An inventory of these critical facilities is included in **Appendix E**, with identification numbers which correspond to Figure 6.

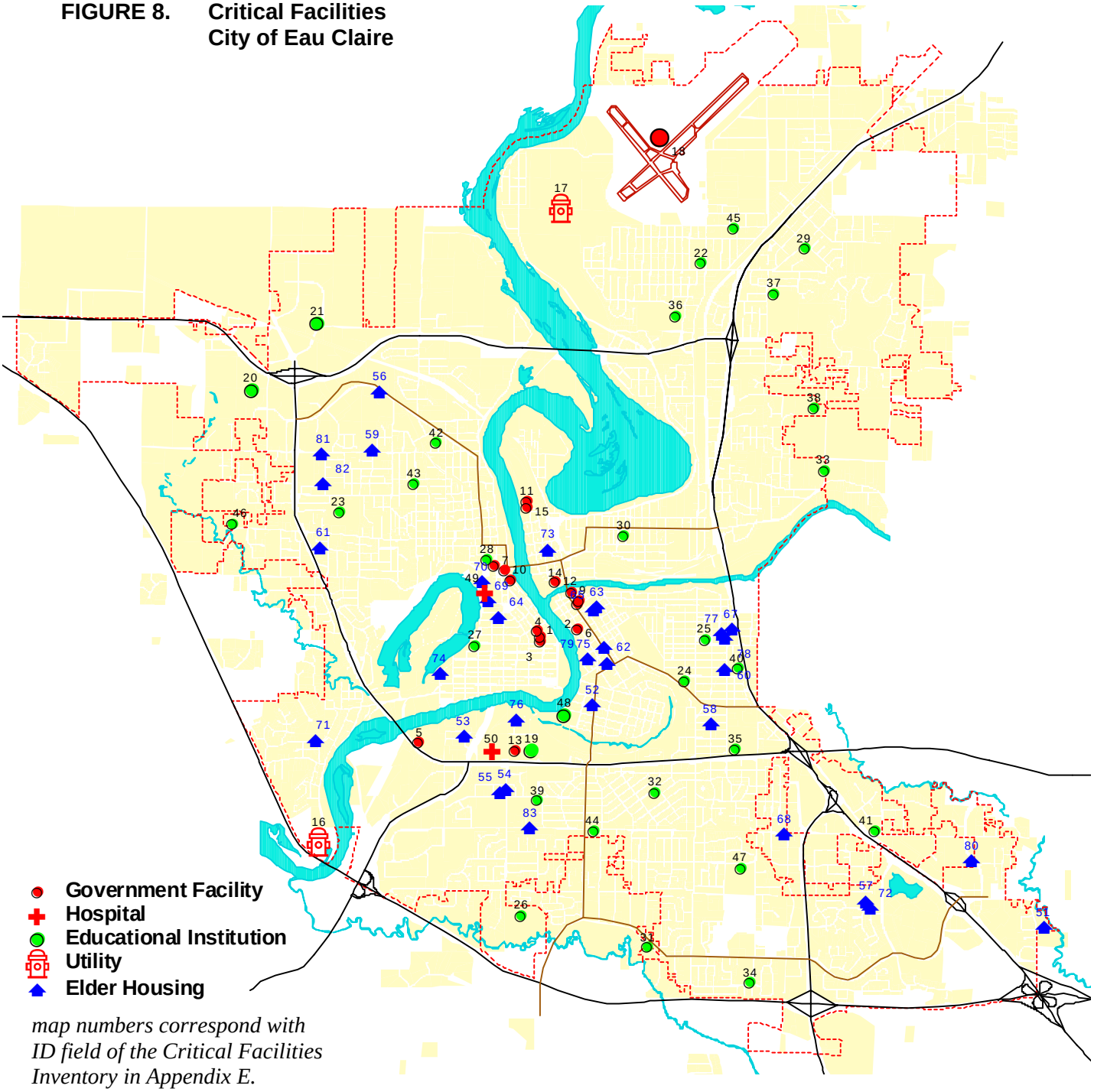
The risk and vulnerability assessment (**Section III.B.**) further analyzes each facility to determine which are more likely to be affected by hazards. None of these structures were considered high potential loss facilities such as military installations, extreme hazardous materials production plants, or a nuclear facility.

Most of the above facilities are considered essential due to their governmental services or emergency responses they provide (i.e., government buildings, law enforcement, hospitals). Educational facilities and elderly homes, which perform an important public welfare function, also represent potential vulnerable populations.

F. HAZARDOUS MATERIAL STORAGE AND USE

Hazardous materials can present special risks to humans and the environment at the time of disaster, as well as pose substantial difficulties and necessitate special precautions for post-disaster clean-up. According to data from the Wisconsin Emergency Management for 2003, there are 81 Tier Two facilities and 22 EHS facilities reported within the City of Eau Claire. Tier Two facility reports are submitted annually, by law (SARA Title III), for any facility that is required to prepare or have available a Material Safety Data Sheet (MSDS) for a hazardous chemical present at the facility. The Tier Two reporting facilities within Eau Claire are inventoried in **Appendix F**. EHS (Extremely Hazardous Substances) facilities store and/or use one of over 300 chemicals with extremely toxic properties. The EHS reporting facilities within Eau Claire are also included in **Appendix F**. These facilities have no unique, inherent characteristics which made them any more vulnerable to the natural hazards covered within this plan when compared to other manufacturing facilities, and thus were not individually analyzed. There are no known Tier Two or EHS facilities located within a floodplain, and floodplain zoning and other land-use controls are used to mitigate such risks (e.g., separation of uses).

FIGURE 8. Critical Facilities
City of Eau Claire



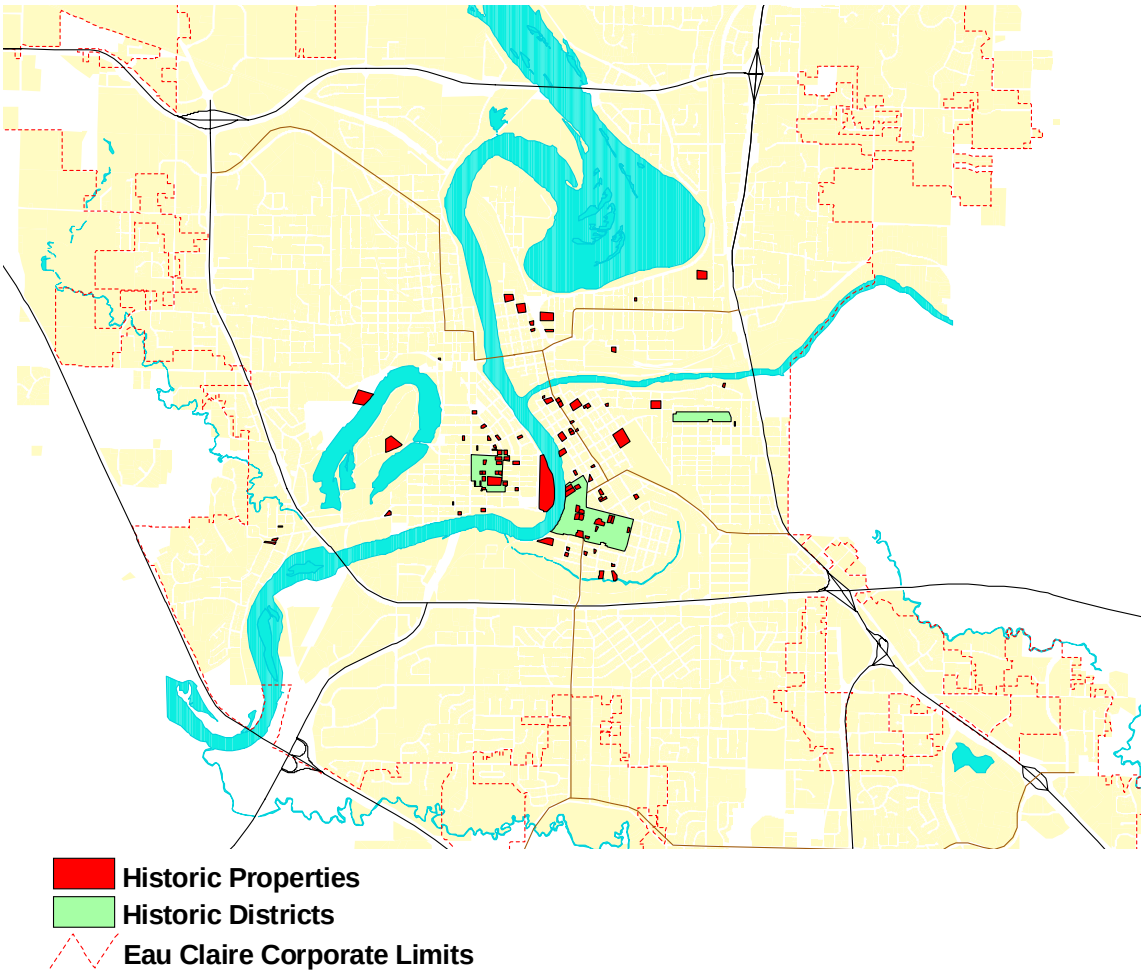
map numbers correspond with ID field of the Critical Facilities Inventory in Appendix E.

G. HISTORIC PROPERTIES AND DISTRICTS

Historic structures, sites, and districts are often targeted for hazard mitigation strategies due to their unique, often irreplaceable, social value. According to the Eau Claire Landmarks Commission[9], the City of Eau Claire has a total of 95 individual historic properties and 3 historic districts which encompass a total of 155 properties, which have received either local or federal historic landmark designation. **Figure 9** shows the location of the City's places of historic significance. An inventory of these historic places is included in **Appendix G**. These historic properties and districts include:

- sites on the National and State Registers of Historic Places
- sites designated by the Eau Claire Landmarks Commission as local landmarks
- sites designated by the Eau Claire Landmarks Commission as being eligible for such local, State and/or national historic designations.

FIGURE 9. Historic Properties & Districts
City of Eau Claire



There have been no known natural hazard events which have substantially impacted a historic property, at least since 1982 when the historic properties inventory was first developed. Most of these historic buildings are very well constructed, and they continue to serve as an important vestige of Eau Claire's past.

[9] Eau Claire Landmarks Commission. Eau Claire Landmarks. Newsletter Vol. VIII. 2002/2003.

SECTION III.

ASSESSMENT OF HAZARD CONDITIONS

In order to more effectively evaluate potential hazard mitigation alternatives and develop feasible strategies to address the risks associated with the identified hazards, the City must:

- identify the hazards which are thought to pose the greatest risk to the residents of the city;
- profile the extent and severity of past hazard events that have affected the city; and
- assess the vulnerability the community to the risk of future hazard events.

This assessment must also consider the current mitigation activities undertaken by the City to address these risks and vulnerabilities.

A. HAZARD IDENTIFICATION

Although the City of Eau Claire could potentially be at risk from a number of different natural hazards, this plan will attempt to narrow the scope of the hazards that will be addressed to those natural hazards that pose the greatest to the residents and facilities of the community. Identification of the hazards was based on a priority rank ordering of the many different natural hazards identified in the *Resource Guide to All Hazards Mitigation Planning in Wisconsin* prepared by the Sate Department of Military Affairs, Wisconsin Emergency Management.

i. Hazard Risk Assessment Survey

Members of the Natural Hazards Mitigation Plan Steering Committee and other City Department heads and staff completed a *Natural Hazard Identification and Risk Assessment Matrix*[10]. Each person was asked to assign a risk rating (1-low, 2-moderate, or 3-high) to the various risk assessment criterion for that hazard. For each risk assessment worksheet, an average risk rating was then calculated for each of the identified hazards. A composite overall average risk rating for each hazard was then calculated by totaling the average risk rating from each respondent and dividing by the total number of respondents. Shown in **Table 8**, is the summary of overall average risk ratings for each hazard that was rated. The rating breakdown by risk assessment criterion (e.g, frequency, probability, business disruption, etc.) for each hazard is included in **Appendix H**.

TABLE 8. Overall Average Risk Ratings City of Eau Claire

Hazard	Overall Avg. Risk Rating
Heavy Snow Storm	2.3
Ice Storm	2.3
Stormwater Flooding	2.3
Blizzard	2.2
Tornado/High Winds	2.2
Extreme Cold	2.1
Riverine Flooding	1.9
Lightening Storms	1.8
Thunderstorms	1.8
Hail Storms	1.6
Extreme Heat	1.4
Flash Flooding	1.3
Fog	1.3
Drought	1.2
Dam Failure Flooding	1.1
Landslide/Land Subsidence	1.1
Forest/Wildland Fires	1.1
Agricultural	1.0
Coastal Hazards	1.0
Earthquake	1.0
Lake Flooding	1.0

ii. Hazard Events Historical Summary

Other information that was also helpful in

[10] matrix taken from: Wisconsin Emergency Management. Resource Guide to All Hazards Mitigation Planning in Wisconsin. April 2003. p.10.

determining what hazards should be evaluated in the plan was past hazard statistics. The National Oceanic and Atmospheric Administration's (NOAA) National Climatic Data Center (NCDC) publishes National Weather Service (NWS) data describing past weather events and the resulting deaths, injuries and damages associated with each of these events; this data is available at the County level. During the period from January 1, 1950 through December 31, 2002, the City of Eau Claire and Eau Claire County has experienced 155 weather hazard events, shown in **Table 9**.

TABLE 9. Natural Hazard Events • 1950 to 2002
(*including deaths, injuries, property damage and crop damage*)
City of Eau Claire/Eau County

Event	Number of Occurrences	Deaths	Injuries	Property Damage
Blizzard	2	1	0	0
Extreme Cold	4	1	0	0
Extreme Heat	6	57	0	0
Flood	4	1	1	3,573,229
Freezing Rain/Ice Storm	5	0	0	0
Hail	38	0	0	0
Heavy Snow	18	0	0	0
Tornado	9	6	20	50,424,171
Thunderstorm/Winds	57	0	0	4,430,229
Winter Storm	7	0	0	0
Drought	**5**	**0**	**0**	**0**
TOTAL	**155**	**66**	**21**	**$58,427,6290**

Source: National Climatic Data Center (NCDC) - 1950-2002; Eau Claire County Hazard Analysis, 1998
Damage estimates in current dollars based on Consumer Price Index by U.S. Bureau of Labor Statistics

The data from the NCDC shows that thunderstorms and associated high winds are the most frequently occurring natural hazard event. This is followed by hail, heavy snowstorms and tornadoes. The most damaging events, in terms of property and crop damage, have been tornadoes and floods. The above occurrences and statistics are for the entire county or for the effected region for regional events; NCDC data is not readily available for individual municipalities within a county.

iii. City of Eau Claire Natural Hazards Prioritization

The purpose of rating the potential risks associated with each hazard (**Table 8**) and reviewing past frequency and severity data (**Table 9**) is to address those hazards posing the greatest threat to residents and property. Based on this information, the Eau Claire Natural Hazards Mitigation Plan Steering Committee identified the following natural hazards to be the focus of the plan assessment, goals, objectives, and strategies:

- floods (includes flash flooding, lake/riverine flooding, stormwater, and dam failure)
- tornadoes
- thunderstorms (includes lightning, hail, and high wind)
- winter storms (includes heavy snow/blizzards and ice storms)
- extreme temperatures (includes extreme heat and extreme cold)

iv. Other Natural Hazards Determined Not to Pose Significant Risk

The following hazards were determined to have a minimal chance of occurring, to pose minimal risk to the safety of the residents or property, or offer only very limited mitigation options. They

are excluded from the full assessment, but are briefly discussed here to meet the comprehensive requirements for developing a natural hazards mitigation plan under Federal law.

Fog

Fog is low-level moisture that can reduce visibility. It can occur in isolated low-lying areas or be a widespread event that can cover several counties. In general, fog is often hazardous when the visibility is reduced to 1/4 mile or less. Thick fog reduces visibility, creating a hazard to motorists as well as to air traffic. Airports may close because of heavy fog. The intensity and duration of fog varies with the location and type of fog. Generally, strong winds tend to prevent fog formation. In the City of Eau Claire, fog occurs infrequently and is typically a short-term weather event lasting only for portions of a day. Fog was not identified as a regional hazard concern by the FEMA-Region 5 office.

Drought

A drought is an extended period of unusually dry weather, which may be accompanied by extreme heat (temperatures which are 10 or more degrees above the normal high temperature for the period). There are basically two types of drought in Wisconsin, agricultural and hydraulic. Agricultural drought is a dry period of sufficient length and intensity that markedly reduces crop yields. Hydrologic drought is a dry period of sufficient length and intensity to affect lake and stream levels and the height of the groundwater table. These two types of drought may, but do not necessarily, occur at the same time.

In general, droughts have the greatest impact on agriculture. Small droughts of limited duration can significantly reduce crop growth and yields. More substantial events can decimate croplands and result in total loss. Droughts also greatly increase the risk of forest fires and wildfires because of extreme dryness. In addition, the loss of vegetation in the absence of sufficient water can result in flooding, even from average rainfall, following drought conditions. Shown in **Table 10**, is a list drought periods for Eau Claire County.

TABLE 10. Periods of Drought Eau Claire County

Year	Location	Description
1976	Countywide	$21,459,918 in crop damage
1988	Countywide	$5,818,087 in crop damage
1989	Countywide	$100, 727 in crop damage
1990	Countywide	$32,031 in crop damage
1991	Countywide	$57,315 in crop damage

Source: Eau Claire County Hazard Analysis, June 1998
Damage estimates in current dollars based on Consumer Price Index by U.S. Bureau of Labor Statistics

Due to the very limited agricultural practices occurring within the city and the infrequency of drought occurrences, drought is not considered a significant event for the City of Eau Claire to warrant individual examination.

Forest/Wild Fires

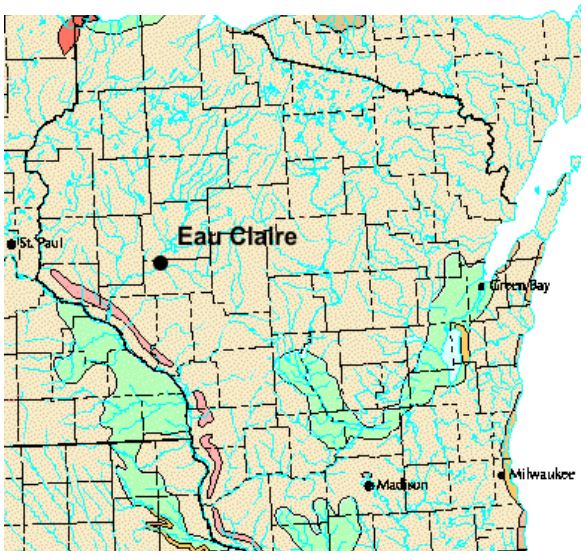
A forest fire is an uncontrolled fire occurring on forest or woodlands. A wildfire is any instance of uncontrolled burning in brush, marshes, grasslands or field lands. Typical causes of these fires are lightening, human carelessness, or arson. The City of Eau Claire has very limited large

expanses of forested areas within the corporate limits and is not located near substantial forest, grasslands, or dense woodlands. According to the U.S. Forest Service Wildland Fire Assessment System, the Eau Claire area typically falls within the low and moderate fire danger classes.[11] Although fires remain a possibility, area fire stations are prepared to respond in accordance with established response procedures, and local zoning setback controls and building codes provide additional mitigation measures. The hazard risks from forest and wild fires upon the City of Eau Claire is considered low.

Landslides and Land Subsidence

The term landslide includes a wide range of ground movement, such as rock falls, deep failure of slopes, and shallow debris flows. Although gravity acting on an over steep slope is the primary reason for a landslide, there can be other contributing factors such as, erosion by rivers, excess weight from accumulation of rain or snow, or from man-made structures may stress weak slopes to failure and other structures. Slope material that becomes saturated with water may develop a debris flow or mudflow.

FIGURE 10. Landslide Hazards in Wisconsin



source: U.S. Geologic Service. Landslide Overview Map of the Conterminous United States. <http://landslides.usgs.gov/html_files/landslides/nationalmap/national.html>.

The USGS *Landslide Overview Map of the Conterminous United States*[12] (excerpt for Wisconsin in **Figure 10**) identifies no large-scale landslide risks for the Eau Claire area. According to the USGS topographic maps and U.S. Natural Resources Conservation Service soil maps for Eau Claire, the majority of land within the City limits has slopes of 5% or less and do not pose a landslide hazard. While there are steeper areas and escarpment within the City, the predominantly sandy soils pose more of a gradual erosion risk, rather than the sudden, large-scale movement of ground associated with landslide hazards. Those areas with the steepest slopes are zoned as conservancy districts by the City and are protected from unsuitable development, further minimizing any related hazard risks. Hillside erosion (minor landslides) within the City is very uncommon and is the result of human impacts (e.g., removal of vegetation). This erosion has not posed substantial risk to life or property, and has been largely mitigated through subdivision law, site plan review, and erosion control plans for construction sites.

Land subsidence is an event in which a portion of the land surface collapses or settles. Common causes of subsidence are in areas having karst topography or in areas in which large amounts of ground water have been withdrawn. The City of Eau Claire is not an area of particularly karst topography, nor is there an over use of ground water for purposes of providing potable drinking water, industrial usage, or agricultural production which could lead to land subsidence.

[11] U.S. Forest Service. Wildland Fire Assessment System. <http://www.fs.fed.us/land/wfas/fd_class.gif>

[12] U.S. Geologiscal Survey. Landslide Overview Map of the Conterminous United States. <http://landslides.usgs.gov/html_files/landslides/nationalmap/national.html>

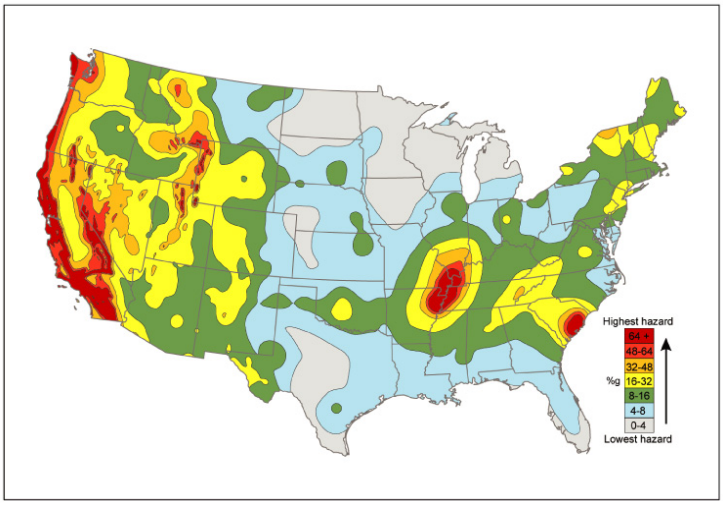
There are no records of substantial damage or injury from large landslides or land subsidence within the City of Eau Claire, and these hazard threats are considered low as reflected in the results of the risk assessment matrix (Table 8).

Earthquakes

According to the U.S. Geological Survey, there have been 19 earthquake events in Wisconsin, with none noted for west-central Wisconsin. Where readings are available, these events were relatively small, most being 3.0-3.8 on the Richter Scale in size and the largest being an intensity of 5, which may be strong enough to crack some plaster, but not cause serious damage. Due to the lack of recent events, some geologists question whether many of these events were true earthquakes, but rather quarry collapses, blasts, etc.

The nearest active earthquake fault outside of Wisconsin is the New Madrid Fault which has a seismic zone which stretches from northeast Arkansas to Southern Illinois. As **Figure 11** shows, the Eau Claire area falls within the lowest earthquake hazard-shaking area, with the different colors representing the levels of horizontal shaking that have a 1-in-50 chance of being exceeded in a 50-year period. Similarly, the City of Eau Claire falls within a 0%g peak ground acceleration (PGA) zone as shown on the USGS PGA values map for the United States with a 10% chance of being exceeded over 50 years; the Eau Claire is a non-effected area.[13] The earthquake threat to the City of Eau Claire is considered very low.

FIGURE 11. U.S. Geological Survey Earthquake Hazard-Shaking Map



source: U.S. Geological Survey. Earthquake Hazard in the Heart of the Homeland. <http://pubs.usgs.gov/fs/fs-131-02/CUShazard.html>.

Coastal Hazards (Hurricanes, Tsunamis, Tidalwaves, etc)

Coastal hazards can cause increases in tidal elevations (storm surges), high winds, and erosion, caused by tropical cyclones (such as hurricanes) or the sudden displacement of water (such as tsunamis from earthquakes). The City of Eau Claire is located in the upper Midwest, approximately 1,000 miles from the Atlantic Ocean, 1,200 miles from the Gulf of Mexico, and 2,000 miles from the Pacific Ocean. The City of Eau Claire also has no large inland lakes within its corporate boundaries. Such coastal hazards have no direct impact on the City of Eau Claire, and only occasionally indirectly impact the City in the form of thunderstorms, which is discussed separately. There were no coastal hazards identified as regional hazard concerns by the FEMA-Region 5 office.

[13] U.S. Geologic Service. Peak Acceleration (%g) with 10% Probability of Exceedance in 50 Years. map. <http://geohazards.cr.usgs.gov/eq/pubmaps/US.pga.050.map.gif> November 1996.

B. RISK AND VULNERABILITY ASSESSMENT

The risk and vulnerability assessment is intended to describe the frequency, severity, and probability of future occurrence of the hazards that have been selected as hazards that could have an impact on the City of Eau Claire. These hazard profiles attempt to historically describe the cause and characteristics of each hazard and how they have affected the City's population, infrastructure, and environment, and the potential risk to the existing (or planned) property and population to each of the hazards.

Although the assessment will attempt focus on the risk potential to the overall community, critical facilities are of particular concern. These entities provide essential products and services to the general public that are necessary to preserve the welfare and quality of life in the community and fulfill important public safety, emergency response, and/or disaster recovery functions. The critical facilities have been identified, mapped, and are illustrated in **Figure 8, Section II.E.** of the plan.

A profile of each hazard discussed in this plan is provided in each individual hazard section. For the purposes of this plan, some hazards have been grouped into logically related hazard topics in order to better organize and describe the extent of the potential risk and vulnerability. The assessment for flooding is summarized below and explored in greater detail within *the 2002 City of Eau Claire Flood Mitigation Plan*. The vulnerability assessment for the other targeted natural hazards which do not have delineated hazard areas are supplemented with a vulnerability assessment matrix.

i. Flooding

Risk Assessment--Flooding

Flooding is a consistently recurring natural hazard in the City of Eau Claire. The last 100-year flood event occurred in 1993, with two 10-year events occurring since then (1996 and 2001).

Because of the recurring nature of flooding, in 2001 the City successfully applied for Flood Mitigation Assistance (FMA) program grant funds to complete a City of Eau Claire Flood Mitigation Plan. This plan was completed and approved by the Wisconsin Emergency Management (WEM) and Federal Emergency Management Agency (FEMA) in May 2002. Thus, this plan will not attempt to duplicate these efforts completed previously by the City.

For the full flood-related risk assessment, please refer to the *2002 City of Eau Claire Flood Mitigation Plan* attached as a special addendum at the end of this plan.

Vulnerability Assessment--Flooding

The City's Flood Mitigation Plan (see *Special Addendum*) also identifies the properties, structures, and critical facilities within the floodplains and their vulnerability to flooding. In summary, the flood mitigation planning process identified 304 parcels with structures located within the floodplain, with a fair market value exceeding an estimated $25.5 million. The flood mitigation plan also identifies the three critical facilities located in the floodplain.

A regional flood would result in an estimated $4 million to structures and contents. More recently, localized, neighborhood flash flooding associated with short duration, high rainfall

events has had greater impacts. In response, the City of Eau Claire analyzed this problem and commissioned Barr Engineering Company in 2000 to develop a detailed, comprehensive analysis and alternative solutions for four neighborhood stormwater "hot spots." The recommendations within the "Barr Engineering Report" were incorporated within the *2002 City of Eau Claire Flood Mitigation Plan.*

While the flooding hazard is reoccurring (both riverine and stormwater), the City of Eau Claire has made great strides to mitigate the impacts, including the use of strategic property acquisitions and by controlling development through zoning; these current flood mitigation activities are discussed in **Section III.C(i)**. For the full flood-related vulnerability assessment, please refer to the *2002 City of Eau Claire Flood Mitigation Plan* attached as a special addendum at the end of this plan.

ii. Tornadoes

Risk Assessment--Tornadoes

A tornado is a relatively short-lived local storm composed of an intense rotating column of air, extending from a thunderstorm cloud system. It is nearly always visible as a funnel, although its lower end does not necessarily touch the ground. Average winds in a tornado, although never accurately measured, are between 100 and 200 miles per hour; however, some tornadoes may have winds exceeding 300 miles per hour.

A tornado path averages four miles, but may reach up to 100 miles in length. Widths average 300 to 400 yards, but tornadoes have cut swaths a mile or more in width, with severe tornadoes or groups of two or three funnels traveling together. On the average, tornadoes move between 25 and 45 miles per hour, but speeds over land of up to 70 mph have been reported. Tornadoes rarely last more than a couple of minutes in a single location or more than 15 to 20 minutes in a ten mile area, but their short periods of existence do not limit their devastation of an area. Shown in **Table 11**, is the Fujita Scale recognized as the acceptable tornado magnitude measurement rating.

TABLE 11. Tornado Magnitude Measurement Fujita Scale

F-Scale	Wind Speed (miles per hour)	Character of Damage	Relative Frequency (percent)
F0 (WEAK)	40-72	Light Damage	29
F1 (WEAK)	73-112	Moderate Damage	40
F2 (STRONG)	113-157	Considerable Damage	24
F3 (STRONG)	158-206	Severe Damage	6
F4 (VIOLENT)	207-260	Devastating damage	2
F5 (VIOLENT)	261-318	Incredible damage (rare)	<1

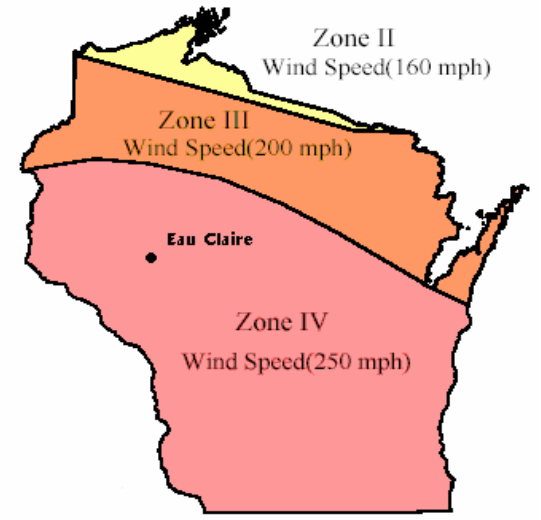
Source: National Oceanic Atmospheric Administration (NOAA)

The destructive power of the tornado results primarily from its high wind velocities and sudden changes in pressure. Wind and pressure differentials probably account for 90 percent of tornado-caused damage. Since tornadoes are generally associated with severe storm systems, hail,

torrential rain and intense lightning usually also accompany them. Depending on their intensity, tornadoes can uproot trees, down power lines, and destroy buildings. Flying debris can cause serious injury and death.

On the basis of 40 years of tornado history and more than 100 years of hurricane history, the United States has been divided into four zones that geographically reflect the number and strength of extreme windstorms. Zone IV has experienced the most and the strongest tornado activity with wind speeds of up to 250 mph, and includes the City of Eau Claire (see **Figure 12**).

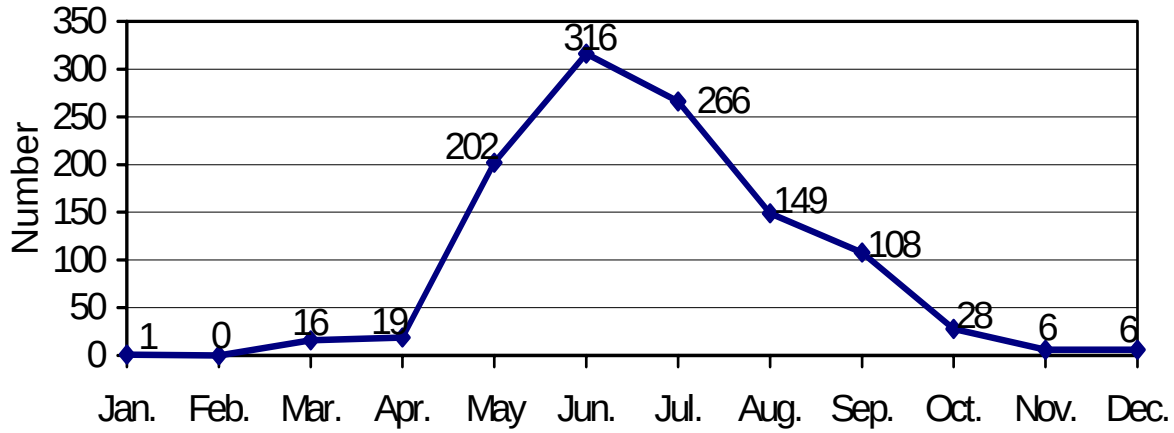
FIGURE 12. Design Wind Speed Map of Wisconsin



adapted from "Design Wind Speed" map from FEMA's "Taking Shelter from the Storms: Building a Saferoom in Your House"

Wisconsin lies along the northern edge of the nation's maximum frequency belt for tornadoes (known as "tornado alley") which extends northeastward from Oklahoma into Iowa and then across to Michigan and Ohio. Yet tornadoes have occurred in Wisconsin in every month except February, shown in **Figure 13** below.

FIGURE 13. Tornado Events by Month • 1844 to 2001 State of Wisconsin



Wisconsin's tornado season runs from the beginning of April through September. The most severe tornadoes typically occur during April, May, and June. Many tornadoes strike in late afternoon or early evening. However, tornadoes have occurred during other times of the day. Personal property damage, deaths, and injuries have and will continue to occur in Wisconsin.
And such tornado events for central and northern Wisconsin (including the City of Eau Claire) are less frequent with 1-5 such events recorded per 1,000 square miles per year on average when compared to the southern portion of the state.[14]

Eau Claire County has had numerous tornadoes of varying degrees of magnitude and severity. Shown in **Table 12**, is a listing of tornadoes that have been reported for Eau Claire County since 1950.

[14] FEMA. Taking Shelter from the Storm. <http://www.fema.gov/pdf/library/2ismsec1.pdf>. p.3.

TABLE 12. Tornado Events • 1950 to 2002
Eau Claire County

Date	Magnitude (Fujita Scale)	Deaths	Injuries	Reported Damage ($)
5-10-1953	F4	0	5	$16,759,259
6-4-1958	F4	4	3	$15,603,448
9-21-1970	F2	0	0	$13,923
7-18-1971	F2	1	2	$1,103,658
6-9-1974	F1	0	0	$11,081
6-16-1979	F1	0	0	$6,198,630
7-15-1980	F3	1	10	$5,571,474
9-12-1982	F2	0	0	$4,664,948
7-3-1983	F2	0	0	$497,750
TOTAL	**- -**	**6**	**20**	**$50,424,171**

Source: National Climatic Data Center (NCDC) 1950-2002
Damage estimates in current dollars based on Consumer Price Index by U.S. Bureau of Labor Statistics

From 1950 to 2002, the Eau Claire County has experienced 9 tornado events (one event may include multiple tornadoes) of varying magnitude and severity. This averages out to be one tornado every 5.7 years. Overall, these 9 tornado events have resulted in 6 deaths, 20 injuries, and over $50 million of damage (in today's dollars), or average damages of $1 million per year.

However, it is important to note that according to the *1998 Eau Claire Hazards Analysis*, only two of these tornadoes--1980 & 1982—can be confirmed to have actually impacted the City of Eau Claire. But, local damage estimates for the 1980 tornado was substantially larger than NCDC estimates, with over $139,000,000 (current dollars) in estimated damages for that single event. Though this demonstrates that tornadoes very infrequently actually impact the City of Eau Claire, the damages can be very substantial.

Of the 9 tornadoes that are documented in **Table 12**, two were categorized as F4, one was an F3, four were F2, and the remaining two were F1. The worst of these events was the tornado that occurred on July 15, 1980. This tornado killed one person, injured 10, and resulted in $63 million of damages (as reported locally), with significant damage occurring from the accompanying high winds.

Vulnerability Assessment - Tornadoes
Tornadoes are capable of killing or injuring residents and damaging or destroying homes, businesses, public buildings and infrastructure. This destruction can occur as a result of the high winds or by airborne debris that can be carried by the tornado. In general, tornadoes can result in damage to structures or property, uprooting of trees, and the toppling of power lines. Roadways can also be blocked by debris, and debris can accumulate in rivers or stormwater systems and contribute to washouts or flooding.

Tornadoes have no defined hazard area within the City of Eau Claire. Due to the unpredictable nature of tornadoes and lack of specific hazard areas, the assessment of community impacts as a result of a tornado are difficult to quantify. However, it is possible to complete an overall review

of the community and identify critical facilities types that may be relatively more at-risk. Based on a review of the community, it was determined that the following general types of properties are vulnerable to tornado events:

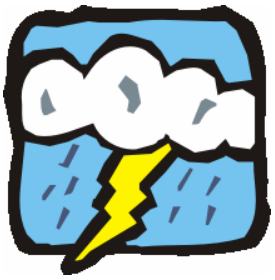
- Residential, Commercial and Industrial Properties
- Utilities including power lines, telephone lines
- Critical Facilities
- Historic Sites

A complete assessment of the community's assets (critical facilities) and their susceptibility to tornadoes is located in **Appendix I**. Though none of the critical facilities have historically been impacted by tornadoes, the vulnerability assessment did yield that hospitals do pose the greatest vulnerability due to their potentially vulnerable population, high value, and emergency response functions. There are no unique natural areas or environmental characteristics within the City of Eau Claire which are vulnerable to tornadoes.

Although the improvement of technology has enabled meteorologists to better identify and predict the conditions that are favorable for tornado development, there is no precise way to predict the formation, location, and magnitude of a tornado. As shown previously, there is no predictable pattern of occurrence or magnitude and resulting damage that can be identified and used to make projections on future tornado events. On average, historically, tornadoes have resulted in approximately $6.36 million in reported damages per event. However, it is important to note that one of these events (7-15-1980) was responsible for 90% of the overall reported damages. In addition, future damage estimates will be influenced by inflation. Thus, the average damage cost is not considered to be representative of future expected damages. It is also sometimes difficult to distinguish between the damage caused by tornadoes and that of the hail, high winds, and thunderstorms which accompany this hazard.

In addition, the continuing changes in land use and development patterns can influence the City's potential for future exposure to tornadoes. As discussed previously, the City of Eau Claire is continuing to grow and develop. This creates an increasing exposure to the number of residents and property that could be at risk from future events. Although new development is managed to insure adequate protection services are provided and construction is governed by the most current building codes, continued growth increases the overall land area capable of being impacted by natural hazard events.

iii. Thunderstorms (including high winds and hail)



Risk Assessment—Thunderstorms

These are severe and violent forms of convection produced when warm moist air is overrun by dry cool air. As the warm air rises, thunderheads (cumuli-nimbus clouds) form, which cause the strong winds, lightning, thunder, hail and rain associated with these storms. The National Weather Service definition of a severe thunderstorm is a thunderstorm event that produces any of the following: winds of 58 miles per hour or greater (often with gusts of 74 miles per hour or greater), hail 3/4 inch in diameter or greater, or a tornado.

The thunderheads formed may be a towering mass six miles or more across and 40,000 to 50,000 feet high. It may contain as much as 1 ½ million tons of water and enormous amounts of energy that often are released in the form of high winds, excessive rains, and three violently destructive

natural elements: lightning, tornadoes, and hail (covered separately in this hazard analysis).

A thunderstorm often lasts no more than 30 minutes, as an individual thunderstorm cell frequently moves between 30 to 50 miles per hour. Strong frontal systems, though, may spawn more than one squall line composed of many individual thunderstorm cells. These fronts can often be tracked from west to east. Because thunderstorms may occur singly, in clusters, or as a portion of large storm lines, it is possible that several thunderstorms may affect one in the course of a few hours.

Severe thunderstorms can cause injury or death and can also result in substantial property damage. They may cause power outages, disrupt telephone service, and severely affect radio communications and surface/air transportation, which may seriously tax the emergency management capabilities of the affected municipalities.

In general, Eau Claire averages two severe thunderstorms per year. However, thunderstorms can occur throughout the year, with the highest frequency during May through September. Shown in **Table 13** is a listing of severe thunderstorms that have occurred in Eau Claire County.

TABLE 13. Severe Thunderstorms and Associated Risk Characteristics • 1950 to 2002 Eau Claire County

Date	Wind Speed (Knots)	Hail	Deaths	Injuries	Reported Damage ($)
5-26-1959			0	0	
4-14-1964			0	0	
7-23-1965	50 kts.		0	0	
8-1-1967	70 kts.		0	0	
8-13-1971	65 kts.		0	0	
9-20-1975			0	0	$80,444
4-12-1977	50 kts.		0	0	
6-4-1977			0	0	
7-24-1977	52 kts.		0	0	
8-31-1977	70 kts.		0	0	
5-27-1978	50 kts.		0	0	
6-15-1978			0	0	
6-16-1979			0	0	
6-5-1980			0	0	
7-15-1980	97 kts.		0	0	see tornado
8-8-1980	52 kts.	0.75 in.	0	0	
6-14-1981	60 kts.		0	0	
7-17-1981		1.50 in.	0	0	$2,478,308
7-20-1981		1.50 in.	0	0	
8-3-1981			0	0	
7-29-1982	52 kts.		0	0	
7-3-1983	52 kts.		0	0	
7-19-1983	55 kts.		0	0	
8-16-1983			0	0	

6-7-1984			0	0	
6-17-1984	61 kts.		0	0	
8-12-1985			0	0	
7-24-1986		1.75 in.	0	0	
9-3-1986		0.75 in.	0	0	
9-26-1986		1.75 in.	0	0	
5-29-1987			0	0	
6-28-1987			0	0	
7-15-1988		1.75 in.	0	0	
5-23-1989		1.75 in.	0	0	
5-30-1989		0.75 in.	0	0	
6-2-1990	70 kts.		0	0	
6-12-1990		1.75 in.	0	0	
6-26-1990		0.75 in.	0	0	
5-27-1991			0	0	
6-17-1992		1.00 in.	0	0	
8-29-1992			0	0	
8-9-1993			0	0	$12,482
7-5-1994			0	0	$67,264
7-22-1995			0	0	
8-12-1995			0	0	
5-19-1996	67 kts.		0	0	$669,815
6-29-1996			0	0	$138,344
8-25-1996		0.75 in.	0	0	
10-22-1996			0	0	
6-15-1997	50 kts.		0	0	
6-28-1997	50 kts.		0	0	
7-1-1997	55 kts.		0	0	$224,845
7-5-1997	55 kts.	0.88 in.	0	0	
10-6-1997		1.75 in.	0	0	
3-29-1998		0.75 in.	0	0	
5-15-1998	55 kts.	1.00 in.	0	0	$81,506
5-31-1998	61 kts.		0	0	$518,571
6-25-1998	52 kts.		0	0	$129,920
6-27-1998			0	0	$41,086
9-25-1998		1.75 in.	0	0	
6-5-1999	52 kts.		0	0	
6-6-1999	50 kts.	0.75 in.	0	0	
7-30-1999	52 kts.		0	0	
9-10-2000		1.75 in.	0	0	
4-23-2001		1.00 in.	0	0	
6-11-2001	52 kts.		0	0	
6-18-2001	55 kts.	0.75 in.	0	0	
4-18-2002		1.00 in.	0	0	
7-28-2002	52 kts.		0	0	
7-30-2002	52 kts.		0	0	

Totals	**0**	**0**	**$4,442,585**

Source: Eau Claire County Hazard Analysis, June 1998; National Climatic Data Center (NCDC) 1950-2002
Damage estimates in current dollars based on Consumer Price Index by U.S. Bureau of Labor Statistics

From 1950 to 2002, the City of Eau Claire has experienced 70 severe thunderstorm events of varying magnitude. Although the storms listed in **Table 13** are classified as thunderstorms, each of these storms had its own unique characteristics and associated risks to residents and property in Eau Claire, including high winds and hail. In fact, the majority of damages listed above were wind-related. However, other risks associated with thunderstorms that were able to be documented with these storms include the potential for excessive rains leading to flash flooding and the potential to spawn tornadoes. Though the 7/15/1980 storm lists no damages, the tornadoes and high winds associated with this storm resulted in an estimated $63 million in damages.

Generally, the City of Eau Claire averages two severe thunderstorms per year. Of the reported thunderstorm events recorded in **Table 13,** 20 had no reported unusual risk characteristics associated with them, 25 had high winds associated with them, 18 included hail, and 5 had a combination of high winds and hail.

Vulnerability Assessment—Thunderstorms

The National Weather Service is able to forecast and track thunderstorms that are capable of producing severe weather conditions such as high winds, hail, lightning, and possibly tornadoes. However, determining the exact location and severity of these conditions is difficult and generally unpredictable. In general, thunderstorms and associated hazards can cause damage to houses or property, uproot trees, and topple (or cause lightning damage to) power lines. Roadways can also be blocked by debris, and debris can accumulate in rivers or stormwater systems and contribute to washouts or flooding.

Thunderstorms have no defined hazard area within the City of Eau Claire. Due to the irregular nature of these events and no specific hazard areas, the community impacts as a result of a thunderstorm are difficult to quantify. However, it is possible to complete an overall review of the community and facilities that may be at risk.

Based on a review of the community, it was determined that the following general types of facilities and community assets are vulnerable to thunderstorm events:

- Residential, Commercial, and Industrial Properties
- General Utilities including overhead power lines and telephone lines
- Critical Facilities
- Historic Sites

A complete assessment of the community's assets (critical facilities) and their susceptibility to thunderstorms is located in **Appendix I**. The vulnerability assessment showed that utilities and infrastructure, and in particular elevated power and communication lines, have the greatest vulnerability due to some typical historic problems, high value, and potential impacts on normal community operations. There are no unique natural areas or environmental characteristics within the City of Eau Claire which are vulnerable to thunderstorms and high winds.

Although the improvement of technology has enabled meteorologists to better forecast and track

thunderstorms, there is no precise way to predict the location and severity of its associated risks. As shown in **Table 13**, there is a no predictable pattern of occurrence or associated risk characteristics and resulting damage that can be identified and used to make projections on future thunderstorm events.

On average, historic thunderstorms (and associated risk characteristics) have resulted in approximately $1.0 million in reported damages per event for Eau Claire. However, it is also sometimes difficult to distinguish between the damage caused by thunderstorms, hail and high winds, and that of tornadoes which occasionally accompany this hazard. For instance, it is important to note that one event was responsible for 95% of the overall reported thunderstorm damages in **Table 13**. During the thunderstorm of July 15, 1980, an F3 tornado was spawned which resulted in $63 million of damage to the community. If this one event were removed from the data, the resulting damage per thunderstorm event would be reduced to nearly $44,000. In addition, future damage estimates will be influenced by inflation. Thus, the average damage cost is not considered to be representative of future expected damages.

In addition, the continuing changes in land use and development patterns can influence the City's potential for future exposure to thunderstorms. As discussed in the community profile, the City of Eau Claire is continuing to grow and develop. This creates an increasing exposure to the number of residents and property that could be at risk from future events. Although new development is managed to insure adequate protection services are provided and construction is governed by the most current building codes, continued growth increases the overall land area capable of being impacted by natural hazard events.

iv. Winter Storms (including blizzards and ice storms)

Risk Assessment—Winter Storms

Winter storms can vary in size and strength, and include heavy snowstorms, blizzards, freezing rain, sleet, ice storms, and blowing and drifting snow conditions. Extremely cold temperatures accompanied by strong winds can result in wind chills that cause bodily injury such as frostbite and death.

A variety of weather phenomena and conditions can occur during winter storms. For clarification, the following are National Weather Service-approved descriptions of winter storm elements:

Heavy Snowfall - the accumulation of six or more inches of snow in a 12-hour period, or eight or more inches in a 24-hour period.

Winter Storm - the occurrence of heavy snowfall accompanied by significant blowing snow, low wind chills, sleet or freezing rain.

Blizzard - the occurrence of sustained wind speeds in excess of 35 miles per hour accompanied by heavy snowfall or large amounts of blowing or drifting snow.

Ice Storm - an occurrence where rain falls from warmer upper layers of the atmosphere to the colder ground, freezing upon contact with the ground and exposed objects near the ground.

Freezing Drizzle/Freezing Rain - the effect of drizzle or rain freezing upon impact on objects that have a temperature of 32 degrees Fahrenheit or below.

Much of the snowfall in Wisconsin occurs in small amounts of between one and three inches per occurrence. Heavy snowfalls, that produce at least eight to ten inches of accumulation, happen on the average only five times per season. True blizzards are rare in Wisconsin. They are more likely to occur in northwestern Wisconsin than in southern portions of the state, even though heavy snowfalls are more frequent in the southeast. However, blizzard-like conditions often exist during heavy snowstorms when gusty winds cause the severe blowing and drifting of snow.

Both ice and sleet storms can occur at any time throughout the winter season from October into April. Early- and late-season ice and sleet storms are generally restricted to northern Wisconsin. Otherwise, the majority of these storms occur in southern Wisconsin. In a typical winter season, there are 3 to 5 freezing rain events; and a major ice storm occurs on a frequency of about once every other year. If a half-inch of rain freezes on trees and utility wires, extensive damage can occur, especially if accompanied by high winds that compound the effects of the added weight of the ice. There are also between three and five instances of glazing (less than 1/4 inch of ice) throughout the state during a normal winter.

Winter storms present a serious threat to the health and safety of affected citizens and can result in significant damage to property. This can occur when the heavy snow or accumulated ice causes structural collapse of buildings, downs power lines, severely affecting electrical power distribution, or cuts off people from assistance or services.

Ice and sleet storms can occur at any time throughout the winter season from November to April. Shown in **Table 14** is a listing of winter storm events, including winter storms, heavy snowfall, freezing rain/ice, and blizzards, that have occurred in Eau Claire County since 1993.

TABLE 14. Winter Storm Events • 1993 to 2002
Eau Claire County

Date	Type of Event	Deaths	Injuries	Damage
11-25-1993	Heavy Snowfall	0	0	0
1-5-1994	Heavy Snowfall	0	0	0
1-16-1994	Heavy Snowfall	0	0	0
11-27-1994	Heavy Snowfall	0	0	0
3-6-1995	Heavy Snowfall	0	0	0
3-27-1995	Heavy Snowfall	0	0	0
11-26-1995	Heavy Snowfall	0	0	0
12-6-1995	Heavy Snowfall	0	0	0
12-13-1995	Freezing Rain/Ice	0	0	0
1-17-1996	Freezing Rain/Ice	0	0	0
1-18-1996	Heavy Snowfall	0	0	0
1-26-1996	Blizzard	1	0	0
2-8-1996	Freezing Rain/Ice	0	0	0
3-24-1996	Heavy Snowfall	0	0	0
11-15-1996	Freezing Rain/Ice	0	0	0
11-20-1996	Heavy Snowfall	0	0	0
11-23-1996	Heavy Snowfall	0	0	0
12-23-1996	Heavy Snowfall	0	0	0

2-4-1997	Heavy Snowfall	0	0	0
3-13-1997	Winter Storm	0	0	0
1-4-1998	Freezing Rain/Ice	0	0	0
3-8-1999	Winter Storm	0	0	0
1-12-2000	Heavy Snowfall	0	0	0
1-29-2001	Winter Storm	0	0	0
2-7-2001	Heavy Snowfall	0	0	0
3-12-2001	Heavy Snowfall	0	0	0
1-31-2002	Winter Storm	0	0	0
2-1-2002	Winter Storm	0	0	0
3-8-2002	Winter Storm	0	0	0
3-14-2002	Winter Storm	0	0	0

Source: Eau Claire County Hazard Analysis, June 1998;
National Climatic Data Center (NCDC) 1950-2002

On average, Eau Claire County typically experiences 3 to 5 winter storm events per winter season. During the ten-year period from 1993 to 2002, the region, including Eau Claire, has experienced 30 winter storm events. These events included 17 heavy snowfall events, 1 blizzard, 5 freezing rain/ice storms, and 7 winter storms. These events resulted in one death (blizzard).

Vulnerability Assessment—Winter Storms

Winter storms can present a serious health and safety threat to area residents and can result in significant damage to property and infrastructure. Snow and ice are the major hazards associated with winter storms. Snow and ice storms can result in an increase in traffic accidents, fell power and communication lines, and impede emergency response capabilities. Extreme cold temperatures and/or wind chills can also pose a serious threat to the health and safety of area residents. These conditions can result in burst water pipes and inflict harm to residents with health conditions susceptible to the extreme conditions.

Winter storms have no defined hazard area within the City of Eau Claire. Due to the irregular nature of these events and lack of specific hazard areas, the assessment of community impacts as a result of winter storms is difficult to quantify. However, it is possible to complete an overall review of the community and identify facilities that may be at risk. Based on a review of the community it was determined that the following general types of facilities and community assets are vulnerable to winter storm events:

- Residents and travelers
- General utilities including power lines, telephone lines, etc.
- Operation of critical facilities

A complete assessment of the community's assets (critical facilities) and their susceptibility to winter storms is located in **Appendix I**. The assessment yielded results similar to that of thunderstorms, with utilities and infrastructure and, in particular, elevated power and communication lines, having the greatest vulnerability due to some typical historic problems, high value, and potential impacts on normal community operations. While there are little or no long-term physical impacts on roads from hazard mitigation perspective, travel upon roads is often hazardous under icy or heavy snow conditions. The other major impacts to critical facilities were also primarily related to accessibility and mobility (e.g., staffing at hospitals, or access to schools). There are no unique natural areas or environmental characteristics within the

City of Eau Claire which are vulnerable to winter storms.

Although the improvement of technology has enabled meteorologists to better forecast and track winter storms, there is no precise way to predict the location and severity of their associated risks. As shown in **Table 14**, there is a no predictable pattern of occurrence or associated risk characteristics and resulting damage that can be identified and used to make projections on future winter storm events. In the past ten years, there has been no reported damage resulting from winter storm events.

v. Extreme Temperatures (including heat and cold)

Risk Assessment—Extreme Temperatures

In contrast to other natural hazard events, the occurrence and impacts of extreme temperature conditions are more difficult to recognize. Excessive heat is a slowly evolving phenomenon that can catch many people by surprise. Unlike tornadoes or thunderstorms that normally develop and occur more quickly and with more observable characteristics, a heat wave typically builds slowly over time. Because of this creeping effect that can occur, it is important for forecasters and officials to be constantly aware of the heat and humidity conditions in order to warn citizens of the risks.

From 1979 to 1999, excessive heat exposure caused 8,015 deaths in the United States. During this period, more people died from extreme heat than from hurricanes, lightning, tornadoes, floods, and earthquakes combined. Although Wisconsin may not be thought of as a high-risk area for deadly heat waves, every year, the State of Wisconsin experiences a period or series of periods in which the temperature and humidity produce a heat index which could be harmful to human health. The following are examples of recent heat wave events effecting Wisconsin.

- During the summer of 1995, two heat waves affected most of Wisconsin. Together, they resulted in 154 heat-related deaths and an estimated 300 to 400 heat-related illnesses. This makes the combined 1995 summer heat waves the biggest weather-related killers in Wisconsin for the past 50 years, far exceeding tornado deaths.

- In 1999, heat waves occurred on July 4th-5th, 23rd-25th, and 29th-31st. Collectively, these heat waves were directly and indirectly responsible for 20 deaths.

- Several heat waves from mid-July through early August 2001 claimed 15 fatalities across Wisconsin. Additionally, it is estimated that 300 or more were treated at hospitals for heat-related conditions.

Heat waves usually consist of high temperatures and high relative humidity. This combination makes it difficult for the human body to dissipate heat through the skin and sweat glands. Sweating will not cool the human body unless the water is removed by evaporation. High relative humidity consequently retards evaporation and thus inhibits the cooling process. The National Weather Service (NWS) uses the heat index as a measure of the combined affects of high temperatures and high relative humidity, shown in **Table 15**.

TABLE 15. Heat Index Table
(Heat Index Values in Degrees Fahrenheit)

Temperature (°F)	Relative Humidity (PERCENT)								
	10	20	30	40	50	60	70	80	90
70	65	66	67	68	69	70	70	71	71
75	70	72	73	74	75	76	77	78	79
80	75	77	78	79	81	82	85	86	88
85	80	82	84	86	88	90	93	97	102
90	85	87	90	93	96	100	106	113	122
95	90	93	96	101	107	114	124	136	
100	95	99	104	110	120	132	144		
105	100	105	113	123	135	149			
110	105	112	123	137	150				
115	111	120	135	151					

Source: National Weather Service

Temperatures in excess of 90°F pose a risk of heat-related illness and death, especially when humidity levels exceed 35%. The risk is highest for individuals who are suffering from chronic illnesses and for those who are not acclimated to these conditions. Most health-related illnesses involve the elderly; however, people on certain medications, including psychotropic drugs; isolated individuals who live alone and seldom leave their home; infants and young children; persons with chronic heart or lung problems; overweight people; persons with disabilities; and people who work outside are also at greater risk during extreme heat events. Research findings strongly suggest that heat index values of 90 to 105 make sunstroke, heat cramps, and heat exhaustion possible with prolonged exposure and/or physical activity. Heat index values of 105 to 130 degrees make sunstroke, heat cramps, and heat exhaustion likely with prolonged exposure and/or physical activity. Shown in **Table 16** is the heat stress index that identifies the potential dangers associated with heat index temperatures.

TABLE 16. Apparent Temperature Heat Stress Index (Dangers Associated with Heat Index Temperatures)

Category	Apparent Temperature (Heat Index - °F)	Associated Dangers
Caution	80-90°F	Exercise, more fatiguing than usual.
Extreme Caution	90-105°F	Heat cramps, exhaustion possible.
Danger	105-130°F	Heat exhaustion likely.
Extreme Danger	Greater than 130°F	Heat stroke imminent.

Source: National Weather Service

Any time the temperature and humidity combine to produce a heat index that could cause health concerns for humans, the National Weather Service will issue various statements on heat conditions. For example, the NWS issues “Heat Advisories” when it expects the daytime heat index to equal or exceed 105° for 3 hours or more, while the nighttime heat index to equal or exceed 80° for any 24-hour period. The NWS issues “Excessive Heat Warnings” when it expects the daytime heat index to equal or exceed 115° for 3 hours or more, while the nighttime heat index to equal or exceed 80° for any 24-hour period. The NWS may issue an "Excessive Heat Watch" 24 to 8 hours in advance of heat wave conditions.

When winter temperatures drop significantly below normal, staying warm and safe can become a

challenge for some residents. In addition, extremely cold temperatures often accompany or follow a winter storm, making it necessary to also cope with other winter weather issues such as high winds, power failures, or icy roads.

Dangerously cold conditions can be the result of extremely cold temperatures, or the combination of cold temperatures and high winds. The combination of cold temperature and wind creates a perceived temperature known as "wind chill." Wind chill is the apparent temperature that describes the combined effect of wind and air temperatures on exposed skin. When wind blows across the skin, it removes the insulating layer of warm air adjacent to the skin. When all factors are the same, the faster the wind blows the greater the heat loss, which results in a colder feeling. As winds increase, heat is carried away from the body at a faster rate, driving down both the skin temperature and eventually the internal body temperature. Shown in **Table 17** are the calculated wind chill temperatures as a result of particular air temperatures and wind speed.

TABLE 17. Wind Chill Table
(Wind Chill Values in Degrees Fahrenheit)

Temperature (°F)	Wind Speed (MPH)								
	5	**10**	**15**	**20**	**25**	**30**	**35**	**40**	**45**
30	25	21	19	17	16	15	14	13	12
25	19	15	13	11	9	8	7	6	5
20	13	9	6	4	3	1	0	-1	-2
15	7	3	0	-2	-4	-5	-7	-8	-9
10	1	-4	-7	-9	-11	-12	-14	-15	-16
5	-5	-10	-13	-15	-17	-19	-21	-22	-23
0	-11	-16	-19	-22	-24	-26	-27	-29	-30
-5	-16	-22	-26	-29	-31	-33	-34	-36	-37
-10	-22	-28	-32	-35	-37	-39	-41	-43	-44
-15	-28	-35	-39	-42	-44	-46	-48	-50	-51
-20	-34	-41	-45	-48	-51	-53	-55	-57	-58

Source: National Weather Service

Whether outside or indoors, exposure to cold temperatures can cause serious or life threatening health problems. Prolonged exposure to the cold can cause frostbite or hypothermia and become life threatening. When exposed to cold temperatures or low wind chills, one's body begins to lose heat faster than it can be produced. The result is hypothermia, or abnormally low body temperature. A body temperature that is too low can affect the brain, making the victim unable to think clearly or move well. This makes hypothermia particularly dangerous because a person may not know it is happening and will not be able to do anything about it. Hypothermia occurs most commonly at very cold temperatures, but can occur even at cool temperatures (above 40°F) if a person becomes chilled from rain, sweat, or submersion in cold water. Victims of hypothermia are most often elderly people with inadequate food, clothing, or heating; babies sleeping in cold bedrooms; children left unattended; adults under the influence of alcohol; mentally ill individuals; and people who remain outdoors for long periods such as the homeless, hikers, hunters, etc.

Frostbite is an injury to the body that is caused by freezing. Frostbite causes a loss of feeling and

color in affected areas. It most often affects the nose, ears, cheeks, chin, fingers, or toes. Frostbite can permanently damage the body, and severe cases can lead to amputation.

In addition to the health risks directly related to exposure to cold temperatures, residents are also susceptible to other risks associated with extremely cold temperatures. For example, many homes will become too cold either due to a power failure or because the heating system isn't adequate for the weather. When people begin to use space heaters and fireplaces to stay warm, the risk of household fires increases, as well as the risk of carbon monoxide poisoning.

Extreme high or low temperature events can occur throughout the year. However, extreme cold events are more likely to occur during the months of January and February and extreme heat conditions are most likely during July and August. Shown in **Table 18** is a listing of extreme temperature events that have occurred in Eau Claire County since 1995.

TABLE 18. Extreme Temperature Events • 1995 to 2001
Eau Claire County

Date	Type of Event	Deaths	Injuries	Damage
2-10-1995	Extreme Cold	0	0	0
7-13-1995	Extreme Heat	5	0	0
1-31-1996	Extreme Cold	0	0	0
2-1-1996	Extreme Cold	1	0	0
1-15-1997	Extreme Cold	0	0	0
7-23-1999	Extreme Heat	0	0	0
7-29-1999	Extreme Heat	0	0	0
7-31-2001	Extreme Heat	0	0	0
8-1-2001	Extreme Heat	0	0	0
8-4-2001	Extreme Heat	0	0	0

Source: Eau Claire County Hazard Analysis, June 1998;
National Climatic Data Center (NCDC) 1950-2002

During the period from 1995 through 2001, the region, including Eau Claire, experienced 10 extreme weather events. These events resulted in six deaths – five heat-related deaths and one cold-related death.

Risk Assessment—Extreme Temperatures

Quietly and often without much warning, extreme temperature events can pose a serious health and safety threat to area residents. During the summer of 1995, several heat waves affected most of Wisconsin, directly resulting in 82 fatalities. Extreme cold temperatures and/or wind chills can also pose a serious threat to the health and safety of area residents. These conditions can result in burst water pipes and inflict harm to residents with health conditions susceptible to the extreme conditions.

Extreme temperatures have no defined hazard area within the City of Eau Claire. Due to the irregular nature of these events and lack of defined hazard areas, the assessment of community impacts as a result of extreme temperatures is difficult to quantify. However, it is possible to complete an overall review of the community and identify facilities that may be at risk.

Based on a review of the community, it was determined that the following general types of

facilities and community assets are vulnerable extreme temperature events:

- All residents, especially the elderly.
- Water utilities.

A complete assessment of the community's assets and their susceptibility extreme temperatures is located in **Appendix I**. The assessment reflects that the City's water system is in good repair, with excellent capacity and water restriction policies in place to ensure an adequate supply of water to meet critical demands. Since 1988, two new wells have been constructed and other substantial improvements made. The system has a capacity of 21-22 million gallons per day, with 13 million additional gallons in storage. The average demand is 9 million gallons per day. In addition, the water systems for the City of Eau Claire and City of Altoona are linked via a water main with a valve to allow a transfer of water between the two communities if demand warrants.

The primary extreme temperature vulnerabilities are related to vulnerable populations, such as the elderly, young children, or others who may not be educated on the dangers of extreme temperatures. Though hospitals ranked highest due to their large number of vulnerable persons, high value, and emergency response role, these facilities are also temperature-controlled and patients closely monitored to mitigate such risks. There are no unique natural areas or environmental characteristics within the City of Eau Claire which are vulnerable to extreme temperatures.

As shown in **Table 18,** there is a no predictable pattern of occurrence or associated risk characteristics and resulting damage that can be identified and used to make projections on future extreme temperature events. Since 1995, there has been no reported damage resulting from extreme temperature events.

C. CURRENT MITIGATION ACTIVITIES

In the context of the natural hazards facing the City of Eau Claire, it is important to consider the mitigation activities and strategies already implemented. The City of Eau Claire has been very proactive in mitigating the impacts of natural hazards, and has been viewed as a model for their efforts. The following section summarizes the current mitigation activities that are being carried out by the City and will demonstrate a strong tradition of communication and interagency cooperation. The majority of City's focus on specific mitigation activities to date has been related to flooding due to the consistent, reoccurring nature of this hazard, though more generalized mitigation activities have also been undertaken for other (or all) natural hazards.

i. Current Flood Mitigation Activities

The floodplain management activities in the City of Eau Claire have primarily included the use of land use controls to prevent the placement of new structures or other inappropriate uses in the

regional floodplain and buyout programs. Over the past 30 years, these activities have combined to limit and reduce the number of structures and residents at risk from flooding. The following section will describe the existing land use controls, flood mitigation grant/buyout programs, and warning and evacuation procedures used by the City of Eau Claire to reduce or eliminate the threat of flood events.

City of Eau Claire Flood Mitigation Plan • 2002

In May 2002, the City of Eau Claire adopted a flood mitigation plan which comprehensively evaluated the existing flood conditions throughout the community and recommended potential flood mitigation strategies and land development alternatives in flood-prone areas. The plan addresses riverine flooding, as well as flash flooding associated with heavy storm events (stormwater). The plan was one of the first of its kind for the State of Wisconsin, and has subsequently become a model for other communities. The *2002 City of Eau Claire Flood Mitigation Plan* is included as a special addendum at the end of this document.

Floodplain Zoning

In order to manage development in the floodplain, the City of Eau Claire has adopted a floodplain ordinance (Chapter 18.11 - Floodplain Overlay District), shown in Appendix C of the *2002 City of Eau Claire Flood Mitigation Plan*. The purpose of this zoning district is to:

> *"protect life, health and property; minimize expenditures of public monies for costly flood control projects; minimize rescue and relief efforts, generally undertaken at the expense of the tax paying public; minimize business interruptions which usually result in the loss of local incomes; minimize damage to public facilities on the floodplains such as water mains, sewer lines, streets and bridges; minimize the occurrence of future flood blight areas on floodplains; discourage the victimization of unwary land and home buyers; and prevent increases in regional flood heights that could increase flood damage and may result in conflicts or litigation between property owners.*"

To date, the implementation and enforcement of the Floodplain Overlay District has effectively controlled the number of residents and structures at risk from flooding. The existing Floodplain Zoning Ordinance is based on the State of Wisconsin model. However, in July 2003, the Wisconsin Department of Natural Resources released a revised *Model Floodplain Ordinance* which incorporated a number of changes for clarification and consistency with FEMA policies and recent court rulings.

Stormwater Management and Detention Activities

The City has been very proactive in mitigating the negative impacts of stormwater hazards and related flash flooding, and has dedicated substantial resources to the primary natural hazard concern facing the City. The City's *2003-2007 Capital Improvements Plan* (CIP) includes $1.76 million per year over the next five years for stormwater mitigation issues, including the creation of detention ponds and the HMGP buyout program described below. This represents approximately 10% of the total CIP budget. The City continues to implement the activities discussed in the 2002 Flood Mitigation Plan, focusing on the locations most vulnerable and reassessing after storm events.

Buyout Programs • Hazard Mitigation Grant Program (HMGP)

In response to the 1993 floods, the City of Eau Claire established a flood buyout program for those areas most directly affected by this flash flooding event. In 1995, the City applied for and was awarded Hazard Mitigation Grant Program funds that comprised the bulk of the buyout program funding. In total, nearly $2.9 million were used to purchase (52) and flood proof (2) properties. Since the completion of the grant in December 1998, the City has also acquired two additional properties through the use of general tax dollars.

Additionally, as a result of property damaged during the September 10-11, 2000, flood event, the City has committed over $9.0 million to acquire 35 properties and make public infrastructure improvements in the affected areas. To aid in this mitigation project, the City applied for and received $1,488,562 of Hazard Mitigation Grant Program funds for the buy-out of 10 properties located in the Taft/Kay area. In fact, since 1993, the City has received over $3.8 million of flood emergency assistance funding. In total, the two flood buyout programs are expected to result in the acquisition of 87 flood-prone properties in the City of Eau Claire.

Monitoring, Warning and Evacuation Procedures

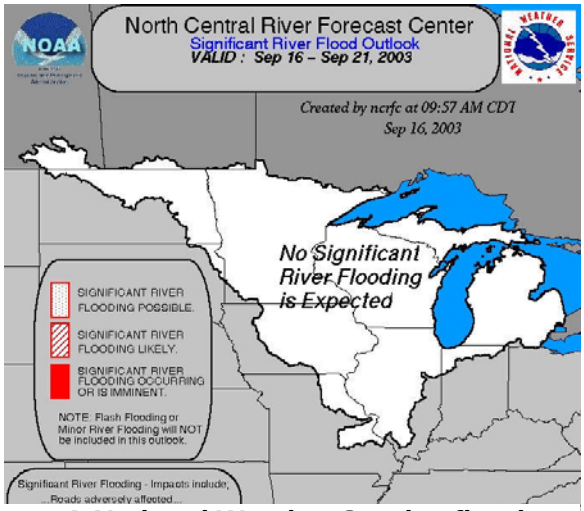
One of the more important aspects involved in reducing the dangers of floods is the ability of the community to monitor flood conditions and warn and evacuate residents and visitors. Since the majority of the City is located within Eau Claire County, the city relies on, and works in close coordination and cooperation with Eau Claire County Emergency Management. More specifically, the City and County work together to monitor situations that have conditions which are favorable for developing into a flood. The City also relies on its own water level monitoring equipment, such as sonic level recorders and transmitters, located at the Grand Avenue pedestrian bridge and Lion's Pavilion in Riverview Park. These gauges send continuous readings of the river level to the Public Works office located in City Hall and to the Wastewater Treatment Facility located on Ferry Street. In the event that a flood is imminent, the City also has developed procedures to properly respond to the flood and warn residents. The specific actions taken by the City and each of its departments are outlined in the Emergency Action Plan section of the *City of Eau Claire Emergency Action Plan Natural Hazards – Floods* last updated in January 2001.

Currently, the City monitors four main types of flood conditions that could require notification and possibly evacuation of the potential flood area. These conditions include, but are not limited to, a developing flood associated with rivers or streams, flash flooding, overland flooding brought on by heavy rainfall, and a catastrophic flood event due to a dam failure.

The flooding of area rivers and streams is typically a result of persistent heavy rainfall or significant snowmelt during the spring. During these conditions, the City utilizes a combination of resources to assist in evaluating the potential flood conditions. Eau Claire County Emergency Management, the National Weather Service, and dam tenders are used to obtain information on the potential flood conditions. This information is used to predict the crest of rising waters and the time of the crest. The public is informed of changing conditions and predictions through an incident command system. This provides public awareness and notification. Typically, in this situation there is not an urgent, immediate need to evacuate people quickly. When it is determined that an area will be inundated by floodwaters, the residents are notified by public service agencies that are monitoring conditions. People can evacuate with their own resources. Emergency service agencies ensure that notifications are received in the local area through announcements and door-to-door contacts as determined necessary.

When conditions are favorable for a flash flood (or for other dangerous weather hazard events), the National Weather Service issues a warning alerting people to the potential through radio, television, and weather alert radios. Conditions are monitored by emergency service agencies. When conditions begin to threaten an area, residents are notified through press releases and press interviews. Local cable, television, and radio stations "cut-in" on normal scheduled programming in such conditions to provide watch and warning alerts that severe weather is approaching.

Law enforcement and other emergency service agencies also notify residents of the advancing flood using public address systems on emergency vehicles and through door to door contacts. Since flash flooding can occur quickly, people are alerted as early as possible of the flood potential so they are aware and watchful of changing conditions. The observations of law enforcement and fire agencies add assistance in determining the timing and need for evacuations.



A National Weather Service flood forecast from 9/16-9/21, 2003.

A dam break provides an entirely different situation. Currently, there are four dams located upstream along the Chippewa River that could have some impact on city properties and residents. These are the Cornell Hydroelectric Project, Holcombe Hydroelectric Project, Jim Falls Hydroelectric Project, and Wissota Hydroelectric Project. In recognition of the potential for a catastrophic flood event, Xcel Energy is required to develop and maintain an Emergency Action Plan to be carried out if any of these facilities failed. In general, the dam tender is responsible for notifying downstream communities when a dam failure appears imminent. All emergency service agencies would be notified by simultaneous emergency radio broadcast of the need to evacuate. Residents would receive immediate warning through the National Weather Service and through local media. Emergency service responders would use public address systems and door-to-door contacts.

100-Year Flood Response Procedures

Although eliminating the exposure of residents and property to the risk of flooding is the most effective means of flood mitigation, some barriers may exist to being able to accomplish this objective in all areas of a community. In these situations, a community must then plan for their response to the events that might place these particular areas of their community at risk.

In the event of a 100-year flood, the city has formulated a response that is necessary to reduce the impacts of flooding to particular areas of the city. In general, the city is divided into five flood response work areas. Within these work areas, the city has identified the problems that typically arise during flood events. The detailed response for each of these areas is described in the Standard Operating Procedures section of the *City of Eau Claire Emergency Action Plan Natural Hazards – Floods* revised in January 2001.

ii. Current General Mitigation Activities

In addition to the flood mitigation activities listed above, the City of Eau Claire has undertaken other mitigation activities addressing other or multiple natural hazards, in large part identified during the key stakeholder interviews which are listed in **Appendix B**.

Project Impact

In 2001, the City was designated a Project Impact Community by the Federal Emergency Management Agency and received $300,000 in grant funding for this initiative. A wide range of mitigation activities has been implemented under this program:

- Public Service Announcements have been released to the community via local radio stations, television stations, and movie theaters. These PSA's have covered a myriad of mitigation topics including floods, emergency vehicles, public works issues, fire safety, hazardous materials, wildland fire safety, storm insurance coverage, and siren alert systems. These PSA's will continue to be used after the Project Impact grant period has formally ended.
- 200 weather radios were purchased and distributed to the critical facilities in the City.
- A computer and software were purchased to enhance the City's Geographical Information System (GIS) and stormwater mapping capabilities.
- All schools in the City were evaluated by a structural engineer to identify appropriate shelter or fall-out areas for occupants in the event of tornadoes or high winds.
- Public educational materials and brochures about fire sprinklers were distributed.
- Two-year calendars were developed containing information on hazard safety and mitigation issues. These calendars were distributed to every household and business in the City, as well as made available at local grocery stores.

In fact, it should be noted that this Natural Hazards Mitigation Plan was developed with Project Impact grant funding. However, Project Impact was discontinued at the Federal level and additional Federal funding for such activities are not anticipated after the current grant period.

City of Eau Claire Building Code

The State of Wisconsin and the City of Eau Claire both have a strong building code enforcement history. The City of Eau Claire has had an adopted Building Code since the 1930's, including regulations which promote hazard mitigation. Currently, the City of Eau Claire Building Code (Chapter 16.04) is a slightly amended version of the State Uniform Dwelling Code; it was last amended in July 2001 and covers one- and two-family dwellings. For commercial construction, the City enforces the Enrolled Wisconsin Commercial Building Code, as well as the State plumbing and electric codes. The Enrolled Wisconsin Commercial Building Code is combination of the State's CBC and portions of the International Code Council model.

Together, these codes incorporate a wide range of mitigation actions, including roofing requirements regarding tie-downs and snow loads. The City of Eau Claire code amends these codes to require that accessory buildings and structures be anchored so as to withstand an uplift pressure of 20 pounds per square foot over the surface area and a four-foot maximum spacing of ceiling ties on conventionally framed pitched roofs. Further, the City's code identifies a special building district in the more dense portions of Eau Claire which requires the use of certain fire-

resistant construction materials. In part due to the relatively small size of the City, local contractors have overall been very conscientious about code compliance.

In 1999, the Insurance Services Office, Inc (ISO) reviewed the City's building code enforcement efforts on the strength of the code and available resources, especially in regards to the mitigation of natural hazards common to the jurisdiction. These scores are used to develop insurance rates for individual properties, and ISO files advisory rating credits for construction during or after the year of the classification. However, the weakness with this system is that many insurers do not utilize, or are simply unaware of, these credits. On a scale of 1-10 (with 1 being highest), the City received a grade of 5, which is very much average. From the 1999 ISO assessment of the City of Eau Claire, two weaknesses in particular were noted: (1) the annual operating budget should include additional training dollars and (2) existing staff levels are insufficient.

As part of the same chapter of the city's building code, the City of Eau Claire also has mobile home park regulations with additional specifications and inspection requirements. This code includes the requirement to have mobile homes properly anchored to mitigate the impacts of high wind events.

City of Eau Claire Land Use Controls

Beyond the floodplain zoning overlay district, the City of Eau Claire Zoning Ordinance, also incorporates additional mitigation measures. These measures include the appropriate separation of uses, building setbacks, a site plan review process, the establishment of a conservancy district zone, the regulation of development in the shoreland-wetlands overlay district, and special density and setback requirements within the mobile home park district zone. The Zoning Ordinance also includes traffic vision triangle requirements at intersections and requires all manufactured homes to be permanently affixed and anchored to a full permanent foundation.

The City of Eau Claire Subdivision Regulations (Title 17) also includes a number of policies to "secure safety from fire, panic and other dangers." Minimum street widths and other design standards are included, including a 500' maximum cul de sac length with minimum 100' diameter turn-around. All utilities should be buried, unless certain conditions or hardships warrant. Stormwater easements are required for any watercourses and drainageways. Site plans must show water elevations (high and low) for adjoining waters and streams. And the site plan review process for major subdivisions involves the Department of Community Development, Department of Public Works, Plan Commission, City Council, other affected committees or departments, local utility companies, West Central Wisconsin Regional Planning Commission, and the State of Wisconsin.

Other Plans or Regulations

Capital projects are identified in the City's Five-Year Capital Improvement Plan. All departments are strongly encouraged to ensure that projects are incorporated into this plan in advance, to minimize any "surprises."

The City can declare a snow emergency and emergency snow routes are established, though there has been interest in reassessing and clarifying these policies. Alternative side parking regulations for snow removal have been adopted and enforced, but can become issues in a few select neighborhoods, especially where street widths are narrower. Snow removal is also coordinated with the City of Altoona to maximize resources and minimize response time. A water usage control policy is in place, and a sprinkling ban can be implemented by the City Manager and Public Works Director if needed.

Incident Response Exercises

The City of Eau Claire also regularly participates in joint incident response exercises, such as mass casualty scenarios. These exercises can involve many neighboring jurisdictions, including Eau Claire County Emergency Management, Chippewa County Emergency Management, City of Altoona Fire Department, county law enforcement, mutual aid fire departments, and private EMS. These exercises include mock events at the Chippewa Valley Regional Airport.

Strategic Intergovernmental Partnership with Eau Claire County Emergency Management

The City of Eau Claire works closely with the County of Eau Claire Emergency Management on hazard mitigation and response issues. This is reflected by the participation of the County's Emergency Management Coordinator as a member of the Steering Committee for this planning effort.

The City and County also participate in a joint Emergency Preparedness Committee and work cooperatively with emergency service leaders to develop plans for emergency response. The latest such plan to receive attention is for bio-terrorism. And this strategic partnership between the City of Eau Claire and Eau Claire County also extends to the County-wide weather siren program and incident response exercises.

Communications

The Eau Claire Emergency Communications Center was established as a joint venture between the City and the County in 1970. The center handles both emergency and non-emergency calls for service countywide in three areas: police, fire, and rescue. The Eau Claire Emergency Center is staffed 24 hours a day with telecommunicators who are trained in handling a multitude of situations. A minimum of three (3) telecommunicators are on duty at one time. The Eau Claire Emergency Center is dispatch for the entire population of Eau Claire County, which includes the City of Eau Claire. The Eau Claire Emergency Center monitors radio traffic and dispatches calls for service for numerous agencies, as well as receives reports of severe weather from community members. During large hazard events or many small events, the Comm Center can become overwhelmed due to insufficient staff; an additional dispatcher per shift is needed.

As part of its five-year CIP, the City has also funded a multi-year process of upgrading and improving the radio communication used by Police, Fire, Public Works, and Parks. This will replace outdated equipment and provide clear, more dependable radio service throughout the City.

Weather Sirens

There are 19 weather sirens located within the City of Eau Claire, which are linked to 8 additional sirens located in other communities within Eau Claire County. These sirens are part of a County-wide outdoor warning system. They are intended to alert people outdoors to severe

weather conditions and provide a cue for residents to listen to their local radio and/or television stations for information concerning severe weather in the area. The sirens are activated primarily in two types of instances: monthly testing, and when a severe weather warning has been issued for any portion of Eau Claire County. This is a unique, pro-active policy enacted following a severe high wind event in 1986.

The policy of the Eau Claire Emergency Center is to sound the outdoor warning sirens countywide when a severe weather warning has been issued by the National Weather Service for any portion of Eau Claire County. The severe weather warning could be related to a thunderstorm, tornado, flash flood, or all of the aforementioned. Sirens are activated to provide a Severe Weather Warning only when severe weather is imminent and allows residents the time to find children, come in off of the lakes if boating, or seek appropriate shelter. Such warnings provide a much better advance warning for possible tornadoes or severe high winds. However, there has been some reluctance by local TV and radio to provide free public service announcements explaining this system, since it is unique to Eau Claire County only. The weather siren equipment is now approaching the end of its expected life; downtime and needed repairs are becoming more frequent.

Hazardous Materials Releases & Response

The City of Eau Claire is very fortunate to have a very strong hazardous materials response program and response plans. The City of Eau Claire Fire Department, working with and contracted by Eau Claire County, is the Level B Hazardous Materials Response Team for all of Eau Claire County. County (or Level B) Teams respond to chemical incidents which require a lower level of protective gear but still exceed the capabilities of standard fire departments. Currently, there are 36 counties in the State of Wisconsin that have a "Level B" Team.

The City of Eau Claire Fire Department has also teamed with the City of Chippewa Falls Fire Department to serve as one of eight regional Level A Hazardous Materials Response Teams. A Regional (Level A) Response Team is contracted by the State of Wisconsin and may be activated for an incident involving a hazardous materials spill, leak, explosion, injury or the potential of immediate threat to life, the environment, or property. The Regional or "Level A" Teams respond to the most serious of spills and releases requiring the highest level of skin and respiratory protective gear. This includes all chemical, biological, or radiological emergencies.

Other Intergovernmental Strategic Partnerships

Communication between the City of Eau Claire and its neighboring jurisdictions (e.g., City of Altoona, Eau Claire County, Chippewa County) has been very positive and proactive. A recent example is the just-completed Bio-Hazard Team and Response Plan which is a possible model for other communities.

For events within the City of Eau Claire, the city would be the primary lead; other agencies, such as Eau Claire County and Chippewa County Emergency Management Departments, would provide support as needed. The City of Eau Claire has mutual aid agreements for the sharing of resources during times of emergency with the following agencies:

State of Wisconsin Hazardous Materials Level A contract
Eau Claire County Hazardous Materials Level B contract
EMS with Gold Cross Ambulance
Fire with Township Fire Department, Inc.

City of Altoona Fire Department
Chippewa Fire Protection District (Fire and EMS)
City of Chippewa Falls Fire Department (Fire and EMS)

Also, these communities have taken the initiative to coordinate their communication systems to ensure compatibility and facilitate communications during and after hazard events. For instance, the City of Altoona is currently upgrading its older communication systems, which will further increase communications with City of Eau Claire response agencies.

The University of Wisconsin-Eau Claire also works closely with Eau County and the City of Eau Claire on emergency management issues. This allows a greater coordination of mitigation and response efforts, and is reflected in documents such as the University's *Emergency Contingency Plan*.

SECTION IV.

MITIGATION GOALS AND STRATEGIES

The City of Eau Claire will continue to proactively protect the health, safety, and welfare of the community by mitigating the negative human, economic, and environmental impacts of natural hazard events. This vision will be accomplished through planning, evaluation, communicating with stakeholders, and maintaining a strong, reliable infrastructure. This plan reflects the City's past, current, and ongoing commitment to hazard mitigation.

A. MITIGATION GOALS

The mitigation goals are intended to provide direction to achieve the desired outcome, and are used as guidelines by which mitigation activities are identified and impact is evaluated. The goals provide the City of Eau Claire further direction for determining the future and reflect the needs of the City as identified through the assessment of hazard conditions and community profile.

Flood Mitigation Goal

Continue to reduce damage and the impacts of flooding, through emergency response planning and other flood mitigation activities.

Flooding (both riverine and stormwater/flash) is the only natural hazard within the plan scope with definable hazard areas within Eau Claire. And, as described in the previous sections, flooding is also the only a reoccurring hazard with a high loss potential. As such, flood mitigation represents much of the recent hazard mitigation focus of the City in terms of capital projects and infrastructure improvements. This is further described within the *Flood Mitigation Plan* included as a **Special Addendum**.

Communication Goal

Continue to strengthen the community's communication infrastructure while encouraging the coordination of hazard mitigation activities between City agencies; the private sector; critical facilities; and other local, regional, State, and Federal authorities.

Building a strong communications network is an ongoing process of evaluation and improvement, especially in a world of quickly advancing technology. As new systems and technologies are considered, even greater attention to compatibility across these networks is needed, to ensure that vital communication between the stakeholders can be maintained. As discussed, the City currently has a multi-year plan to upgrade its communication infrastructure. The current mitigation activities also reflect the City's positive working relationships with critical facilities and other government agencies on hazard mitigation issues.

Education Goal

Encourage Eau Claire citizenry and government to be informed regarding natural hazards and hazard mitigation activities, policies, and opportunities.

The Education Goal reflects a commitment to continue the successes of the Project Impact public service announcements and other educational efforts discussed previously. It also reflects a commitment by the City government and officials to stay informed on hazard mitigation trends, opportunities, and related regulatory changes, and to continue to maintain a well-trained workforce prepared for hazard events.

Planning and Regulatory Goal

Promote hazard mitigation through the evaluation and development of appropriate plans and regulatory policies, and their effective and uniform implementation and enforcement.

The previous description of current mitigation activities includes those plans and regulatory tools which incorporate hazard mitigation strategies. These plans and policies should be periodically evaluated and amended if needed. Hazard mitigation opportunities should also be considered as community growth occurs or new critical facilities are constructed, as discussed in the community profile.

B. EVALUATION OF ALTERNATIVE MITIGATION STRATEGIES

A comprehensive range of alternatives was considered when developing strategies to meet the plan vision and goals. Potential mitigation strategies were identified during the key stakeholder interview process, Steering Committee meeting, and review of hazard mitigation materials and similar planning efforts. A feasibility analysis of these alternatives is included in **Appendix J** which rated the technical feasibility, costs, benefits, and other considerations for each alternative strategy. The Steering Committee members reviewed the feasibility study and identified through consensus the recommended strategies for inclusion within the plan.

Please note that the recently adopted *City of Eau Claire Flood Mitigation Plan* was comprehensive in both scope and its consideration of alternatives. As such, the implementation of the Flood Mitigation Plan is considered a single strategy in the context of this Natural Hazards Mitigation Plan.

Those mitigation strategies deemed feasible for implementation by the Steering Committee were then reviewed from a cost-benefits perspective. A copy of this analysis is included in **Appendix K**. The cost-benefits analysis is not a detailed fiscal analysis of each strategy, but, rather, builds upon the feasibility analysis to identify any potential barriers or challenges to implementation. The cost-benefits analysis was also used during the development of the Mitigation Implementation Plan in **Section IV.D** to prioritize the strategies. It should be noted that the majority of recommended strategies were planning exercises, public relations activities, or policy changes to be implemented by existing personnel; no specific implementation costs are given since new budget allocations for such strategies are not anticipated.

C. RECOMMENDED MITIGATION STRATEGIES (ACTION PLAN)

Each of the following mitigation strategies is organized by the plan goal to which it corresponds. These strategies are specific actions and projects selected based on their feasibility to assist the City of Eau Claire in attaining each strategy's corresponding goal. Though this plan focuses on natural hazards, many of the strategies will improve emergency services and mitigate negative impacts regardless of the hazard type. Some strategies may also have a strong emergency preparedness emphasis, but have been included for their importance in helping to mitigate the negative impacts of natural hazards when they do occur.

i. Flood Mitigation Strategies

#1 Implement the *2002 City of Eau Claire Flood Mitigation Plan* (see **Special Addendum**), which included the following plan recommendations:

a. Conduct an annual review of the *Flood Mitigation Plan.*
b. Review the floodplain zoning ordinance and other regulatory tools for compliance with State and Federal regulations.
c. Periodic review of the transportation system for access/egress during regional floods.
d. Address the Forest Street levee.
e. Implement the recommendations within the "2000 Barr Engineering Report" to address neighborhood stormwater/flash flooding, which included the purchase and removal of homes, construction of stormwater detention facilities, and improvements to the stormwater drainage system. (in progress)
f. Regular review of the Flood Emergency Action Plan and develop a detailed incident command system.
g. With Eau Claire County and Chippewa County, annually publicize the potential for flooding and related safety procedures during events.

#2 Improvements to Forest Street Levee and related stormwater discharge; commence with engineering study and preliminary design (see **Figure 14** on next page).

#3 Review and amend as needed the City of Eau Claire Floodplain Zoning Ordinance to be consistent with the Wisconsin Department of Natural Resource Model Floodplain Ordinance revised in July 2003.

#4 Stay informed on the progress of NR116, and reevaluate (and amend as needed) the City's Floodplain Ordinance to be consistent with NR116 if it become law.

#5 Investigate with Wisconsin Department of Natural Resources alternatives to contiguous dry land access code provisions and associated costs.

ii. Communication Strategies

#6 Encourage the compatibility of City's communication equipment with adjacent jurisdictions (e.g., County Mark frequency repeaters)

#7 Move to high-bandwith wireless service for City police, fire, public works, and parks vehicles, to include mapping, Tier II reports, building plans, etc.

Figure 14.

Forest Street Levee

approximate location of Forest Street levee

#8 Provide fiber-optic communication line to backup Emergency Communications Center.

#9 Replace/upgrade City repeater system.

#10 Replace/upgrade ModuCom radio dispatch console.

#11 Encourage the local governments in County to form a group to reassess the severe weather siren system and encourage a more localized siren alert system.

#12 Develop a policy which identifies the City contact(s) responsible for contacting Wisconsin Emergency Management to obtain a disaster declaration and for requesting National Guard assistance if needed.

#13 City and County should move to a common mapping and Geographic Information System (G.I.S.) platform. *(unless software changes increases compatibility in interim)*

#14 Coordinate with hospitals and clinics within the City to identify capacity and capabilities of available medical services for emergency response.

#15 Work with the two hospitals to develop action plans for security and perimeter enforcement in the event of large-scale hazard events or a security "red alert."

iii. Education Strategies

#16 Encourage citizens to purchase and use weather-alert radios at home or while recreating.

#17 When opportunities arise, request Wisconsin Emergency Management and FEMA to increase access to training and training funds, especially when provided funding for equipment.

#18 Initiate a public education campaign to increase the visibility of address numbers on all structures.

#19 Revisit the snow emergency policy and plan, and initiate related public relations efforts to clarify its meaning and purpose.

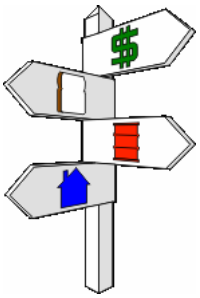
#20 Continue public service announcements on general hazard mitigation topics, using available cost-efficient methods such as community television and phone books.

#21 Support City emergency response staff membership in professional organizations.

#22 Work with the Eau Claire Area Hmong Mutual Assistance Association to produce educational literature on hazard mitigation and response, as well as provide a speaker periodically to the Hmong radio talk show.

#23 Encourage business owners to review and maintain hazard mitigation and recovery plans.

iv. Planning and Regulatory Strategies



#24 Develop an evacuation plan which provides guidance in case a large area of the city must be evacuated.

#25 Establish an intergovernmental agreement to share resources for a surge in building inspections and permits associated with post-disaster reconstruction.

#26 Develop formal emergency shelter agreements for displaced residents, travelers, or during extreme temperature events. Identify shelters with adequate space, generators, HVAC systems, and facilities.

#27 Maintain the City's relationship with the Red Cross in disaster recovery for the City of Eau Claire; include the Red Cross in exercises.

#28 Require new mobile home parks and encourage multi-family development to include on-site safe shelters for severe storm events.

#29 New subdivisions and development should be analyzed for siren coverage. Consider a special assessment to the developer if siren installation is needed.

#30 Continue to implement and enforce the maximum 500-feet cul-de-sac length within

the City Subdivision Ordinance.

#31 Develop agreements with mutual aid providers to establish minimum standards for service levels, to include personnel and equipment if deemed necessary.

#32 Adopt a Fire Sprinkler Ordinance which requires fire sprinklers for all new commercial properties. *Note: This strategy is proposed for large commercial structures to provide added fire detection and containment; it will not impact the fire-fighting model or strategies.*

#33 Following substantial hazard events, re-assess mitigation plans and response activities for efficiency and effectiveness; amend policies as needed.

D. MITIGATION IMPLEMENTATION PLAN

The mitigation implementation plan is included in **Appendix L**. Based on the costs-benefits analysis, each strategy was assigned a relative priority and timeline for implementation. Further, funding sources and responsibilities are also identified for each strategy.

As noted in the discussion of the costs-benefits analysis, the majority of the strategies will utilize program budgets for implementation. However, like many municipalities, the City of Eau Claire is facing fiscal challenges and resources are limited. As such, the prioritization of the strategies offers guidance to departments in the implementation of this plan as resources and staff time allow. And as the implementation plan reflects, with such challenges also come opportunities to form or strengthen strategic partnerships to share and leverage existing resources.

Two projects for the City of Eau Claire which are encompassed within Strategy #1 remain on the Wisconsin Emergency Management's potential mitigation projects list[15] as unfunded Section 404-Hazard Mitigation Grant Program (CFDA #83.548[16]) projects:

DR-994 (1993)	Replace outfall pipe; install valve manhole with stormwater pumping chamber and platform. 2001 cost estimate: $142,921.
DR-1332 (2000)	Acquisition of land and construction of 3 detention ponds (not in floodplain). 2001 cost estimate: $555,000.

The Forest Street Levee project (Strategy #2) is also a possible candidate for Section 404-HMGP funding, or for funding from the FEMA Pre-Disaster Mitigation Program (CFDA #83.557) or FEMA Flood Mitigation Assistance Program (CFDA #83.536). The Army Corp of Engineers is also a potential funding source through their Section 205 program (CFDA #12.106).

Grant funding will also be pursued for strategies #7, #8, and #10. Possible grant sources include those FEMA programs previously noted, the U.S. Department of Health and Human Services (CFDA #93.952), FEMA (CFDA #83.566), and the U.S. Department of Homeland Security (CFDA #97.055, #97.052). Contact with Wisconsin Division of Emergency Management will be maintained for additional funding opportunities.

[15] Wisconsin Emergency Management. State of Wisconsin Hazard Mitigation Plan. July 2001. Appendix F.
[16] The Catalog of Federal Domestic Assistance (CFDA) is on-line and fully searchable at www.cfda.gov.

SECTION V.

PLAN ADOPTION AND MAINTENANCE PROCESS

A. PLAN COORDINATION

The mitigation implementation plan in **Appendix L** also links the mitigation strategies to any related plans or policies. Most notably, the previously approved and adopted 2002 City of Eau Claire Flood Mitigation Plan is incorporated within this document. Other potential plan or policy impacts include:

- Strategies #3, #4, and #5 may require amendment of the City's Floodplain Ordinance. Strategy #5, if alternatives are identified, may require amended Flood Response Procedures and allow additional development, thus impacting the City's Land Use Plan.
- Strategies #8, #9, and #10 all have potential impacts on the City's Capital Improvement Plan.
- Strategy #19 may result in modification to the Snow Emergency Policies.
- Strategies #28, #29, and #30 all have links to the City's Zoning and/or Subdivision Ordinances. Strategies #28 and #29 may require amendments.
- Strategy #32 creates a Fire Sprinkler Ordinance, which could possibly be tied to the Building Code by reference.
- Strategy #33 is further described within this Natural Hazards Mitigation Plan within this section.

B. PLAN MAINTENANCE

i. Annual Plan Reviews

The Eau Claire Natural Hazards Mitigation Plan will be evaluated on an annual basis in order to determine if the plan has become obsolete, if conditions have changed within the City, or if new technologies/approaches to hazard mitigation have become available. This will be a formal process to monitor the implementation of the mitigation activities and progress towards the plan goals.

The City of Eau Claire through its Emergency Preparedness Committee shall complete periodic reviews. A review will take place within one year of the completion and adoption of the plan by the City Council, and annually each March thereafter. The review shall consider the following:

1. Review of development trends and any changes in existing conditions.
2. Review of any new mandates, rules, etc, as well as any input from Wisconsin Emergency Management (WEM) and Federal Emergency Management Agency (FEMA) regarding plan implementation.
3. Review of the plan goals.
4. Review of mitigation plan activities, including:
   a. completed activities and their effectiveness

b. activities yet to be completed and funding sources.

5. Potential new strategies or activities.
6. Public input received on the plan and activities.

Annual review meetings shall be subject to the Wisconsin Opens Meeting Law and properly noticed to allow for public involvement and comment. The Chair of the Emergency Preparedness Committee will have primary responsibility for establishing meeting dates, distributing related materials, and facilitating the meetings.

After completion of each annual review, the Emergency Preparedness Committee shall recommend any revisions or amendments to the plan as necessary. The revisions shall be forwarded to the Plan Commission for their consideration and action.

ii. Special Post-Disaster Reviews (Lessons Learned Best Practice)

Within three to six months following a significant natural hazard event as determined by the Emergency Preparedness Committee, a special post-disaster review will occur. Information regarding the recent disaster shall be collected by the Committee Chair from local law enforcement personnel, fire department personnel, City of Eau Claire disaster response personnel; Department of Natural Resources, Wisconsin Emergency Management, and FEMA personnel; affected citizens; and any other relevant entity. This information shall be provided to the Committee for their review.

At a duly called and posted public meeting, the Committee will analyze factors which contributed to any impacts of the hazard event, the likelihood of the event reoccurring, and any strategies which should be implemented to mitigate the impacts in the event of a reoccurrence. The Committee Chair will have primary responsibility for establishing post-disaster review meeting dates, distributing related materials, and facilitating the meetings. The Committee Chair will also advertise these special meetings to affected department heads, citizens, or community groups, so additional input and comment can be received. Special post-disaster review meetings shall be subject to the Wisconsin Opens Meeting Law and properly noticed to allow for public involvement and comment.

The Committee may select to revise or amend the existing plan. Any recommended changes to the plan shall be forwarded to the Plan Commission for their action and consideration.

iii. Plan Updates

Every five years, the Natural Hazards Mitigation Plan shall be comprehensively reviewed, current data collected, and fully updated. The next full plan update shall be completed and adopted no later than January 1, 2009. This planning effort should be robust and incorporate opportunities for public involvement, to meet all requirements of 44 CFR Part 201.6 and/or any applicable requirements or regulations developed in the interim. At that time, and based on the direction of the Emergency Preparedness Committee, the Committee Chair shall propose a plan update steering committee and process for City Council approval. Plan update steering committee meetings shall be subject to the Wisconsin Opens Meeting Law and properly noticed to allow for public involvement and comment.

C. PLAN ADOPTION

On March 9, 2004, the City of Eau Claire Council considered and adopted this plan in a duly posted and held public meeting. A copy of the adopting resolution and related agenda and minutes are attached (see **Appendix A**). This approval process is described in detail in **Section I.B** at the beginning of this plan.